HUMAN HEALTH RISK ASSESSMENT

BRIDGEPORT RENTAL AND OIL SERVICES SITE

Logan Township, New Jersey

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Final Draft

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TABLE OF CONTENTS

800002

List of Figures and Tables

Figures

Tables

ANNEX(ES)

EXECUTIVE SUMMARY

AMEC Earth & Environmental Inc. (AMEC) prepared the following baseline human health risk assessment (HHRA) of the BROS Superfund Site in support of site investigation and remedial activities. This evaluation is an integral component of the BROS Technical Committee Remedial Investigation and analysis to protect human health and the environment at the BROS Site.

The starting point for this risk assessment was validated environmental sampling data collected from the BROS Superfund Site that reflect current conditions and historical trends. The risk assessment incorporates a large media sampling database, state-of-the-art fate and transport modeling, and where appropriate, site-specific exposure assessment parameters.

In conducting this risk assessment, USEPA guidance on Superfund Sites as well as general risk assessment practices were followed. Additionally, through meetings with USEPA, input was solicited on a variety of technical matters that were, at times, not clearly addressed in Agency guidance documents.

The BROS HHRA was prepared to fulfill the requirements of a baseline HHRA as outlined by USEPA in its Risk Assessment Guidance for Superfund (RAGS) (USEPA, 1989) and in subsequent guidance and policy documents. Moreover, as articulated in the USEPA-approved *BROS Phase 2 RI/FS Work Plan* (WP; Roux, 1999a), the HHRA was explicitly designed (1) to provide the information necessary to support an informed risk management decision with regard to the ground water and wetlands for the protection of human health; (2) to aid in the development of actions that lead to a reduction in overall risks; (3) to recognize the CERCLA remedial actions already completed at the Site; and, (4) to provide the baseline evaluation of risks for comparison to risk reduction measures considered in the Feasibility Study (FS).

E.1 OVERVIEW

The Baseline Risk Assessment was conducted in multiple steps and included an interim deliverable, the Exposure Pathway Analysis Report (EPAR; Roux, 2002). The HHRA builds upon the exposure analysis framework set forth by the *BROS Phase 2 RI/FS Exposure Pathways Analysis Report* (EPAR; Roux, 2002), and reflects subsequent discussions with

USEPA following its review of this document. The EPAR provided a preliminary assessment of on- and off-property BROS-related chemicals in relation to the potential for human exposure under current and reasonably foreseeable future land use conditions.

The risk assessment approach developed for the BROS Site emphasizes the following elements:

- A detailed conceptual model of the Site;
- Background conditions in soils, surface water, and ground water;
- Site-specific characterization of probable exposure frequency and duration by determining current and future receptor activities in various portions of the site;
- Sampling at the locations of actual and potential exposure points in a manner that will yield representative concentrations;
- Estimating exposure point concentrations using the most recent and representative data available for each area. Although the risk assessment evaluates potential risk now and in the future if no remedial action is taken, the BROS Site Phase 2 RI/FS is a retrospective study, since the release of contaminants occurred primarily in the past. The contaminant concentrations used in this risk assessment therefore represent current levels. Existing groundwater data indicate decreasing concentrations of both parent compounds and degradation products, a trend that is predicted to continue in the future. Any potential overestimation and underestimation of this is discussed in the uncertainty section;
- Evaluating risks posed by the entire site, in addition to areas of concern or hot spots which are distinguished by differing chemical types, concentrations, sources of contamination, spatial or temporal variability, sampling methods employed and/or other relevant factors;
- Realistic data quality objectives based on site-specific conditions; and
- Recognition that there can be significant interrelationships between the human health risk assessment and the ecological risk assessment, especially when the results of both baseline risk evaluations are taken into consideration in the Feasibility Study.

E.2 BROS PROPERTY LAND USE CONSIDERATIONS

In May 1997, the Settling Defendants reached an agreement with the owners of the BROS Property that included three perpetual deed restrictions in the form of Declaration Restrictive Covenants that were promptly established for the BROS Property, including the Pepper Building, the former Lagoon and former Process Areas. These restrictions are necessary to maintain the integrity and ensure the protectiveness of the Phase 1 remedy, and are consistent with New Jersey prohibitions (N.J.A.C. 7:26-2A.6 (i)(2)) of residential construction or potable ground water supplies within 150 feet of a solid waste disposal unit (i.e. the lagoon incineration ash). These deed restrictions are currently in place and properly recorded. The provisions of the restrictions include:

- Future use of the property excludes residential use and limits other uses to non-retail commercial and/or industrial use. These uses are consistent with the use at the time the release of hazardous substances began.
- All subsurface activities (e.g., digging) are prohibited without prior written approval of the USEPA and NJDEP.
- The installation and/or use of any ground water wells at the Site is prohibited without prior written approval of the USEPA and the NJDEP.

Beyond the BROS Property, ground water use throughout the Site is limited because all residents have been connected to the municipal water supply that has also been made available to residents near the Site. Moreover, Classification Exception Area (CEA) and Well Restriction Area (WRA) designations have been established for portions of the Water Table and the UMPRM aquifers (Roux, 2002b). The purpose of establishing the CEA/WRA at the BROS Site was to provide notice that the constituent standards for portions of the Water Table and the UMPRM aquifers are not met and that designated aquifer uses in localized areas are restricted unless special precautions or treatment is employed prior to water use. A CEA/WRA designation was established for the BROS Site because Site-related chemical constituents have been detected in ground water at concentrations that exceed the NJDEP Ground Water Quality Criteria (GWQC) (N.J.A.C. 7:9-6.7). In combination, these institutional controls provide overlapping assurances of protection and supplement remedial actions and engineering control.

E.3 DISCUSSION OF EXPOSURE AREAS

The BROS HHRA was prepared in conjunction with the previously submitted (2002) Exposure Pathways Analysis Report (EPAR [Roux, 2002]). The EPAR, consistent with the BROS Consent Decree (1996) and USEPA approved Work Plan (Roux, 1999), provided justification in support of evaluating exposures on the basis of Areas of Concern (AOCs) and Hot Spots relying upon USEPA RAGS Part A Guidance (1989)), which recommends grouping exposures by AOCs when they:

- have different chemical types;
- have different concentrations or hot spots;
- are a release source of concern;
- differ from each other in terms of the spatial or temporal variability of chemical;
- must be sampled using different equipment; and/or
- are more or less costly to sample.

AOCs were distinguished consistent with the above six USEPA-defined criteria (EPAR, 2002), chiefly due to the distribution of Site-related chemicals over a large area, both horizontally and vertically. The supporting rationale for the identification of the AOCs is found throughout the RI and has been compiled and summarized in Chapter 4 (Section 4.4 of the RI Report). Accordingly, the HHRA focuses on an evaluation of risks posed by each discrete AOC, and will consider (and quantify) cumulative risks as part of the uncertainty analysis where overlap among exposures may be possible across two or more AOCs.

Eleven (11) Areas of Concern (AOCs) (Figures 1-3, 1-4, and 1-5; Figures 4-1, 4-2, 4-3 and 4-4 in Section 4 of the RI Report) emerged as a result of the various media investigations and through discussions with USEPA. These AOCs include:

- Soil AOC BROS Property and Shallow Ground water (GW) AOC-1A (Excluding Hot Spots 1 & 2)
- Hot Spot 1 (Soil AOC 1, GW AOC-1A) on the BROS Property

- Hot Spot 2 (Soil AOC 6, GW AOC-1A) on the BROS Property
- Debris/Fill Area (Soil AOC 3, GW AOC-1A) on the BROS Property
- West Side of Property (Soil AOC 5, Shallow GW AOC-1B)
- South Side of Property (Soil AOC 4, GW AOC-1C)
- Drainage Swale Adjacent to the BROS Property (Soil AOC 2, GW AOC-1D)
- Vapor Exposure AOCs
- Deep Ground water (below 40' of Ground Surface) AOCs
- Wetland (Surface Water and Sediment) AOCs
- Cedar Swamp/Little Timber Creek Channel AOC

Estimates of receptor-specific exposures and risks were completed for each of the AOCs identified above which are discussed in greater detail in sections to follow.

E.4 SAMPLING DATA SUMMARY/IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPC)

Data collected as part of the Phase II RI/FS constituted the majority of the data used in the HHRA. Historical data were used to supplement the current data, where necessary, provided that it underwent data validation review and its usability was verified. Media sampled at the Site include soils, ground water, surface water, sediment, LNAPL, drum wastes, lagoon residuals, biota (fish and small mammals) and fruit (peaches) (the reader is referred to Chapter 4 [Section 4.4] of this RI Report which presented the universe of sampling data results). Samples collected at the Site were analyzed for a variety of geochemical and geotechnical parameters to support remedial decision-making. Principally, samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH) and metals.

Data within each soil/sediment AOC were evaluated from the perspective of the potential current or future contact that individuals may have with the soil or sediments in question. For

surface soil/sediment, the top six inches tended to be the cutoff in summarizing sampling data for the purpose of evaluating potential health risks due to COPC at the surface.[1] For subsurface soil, a limiting depth of six feet below ground surface was used in developing COPCs for subsurface soil. This six-foot depth limit corresponds approximately to the typical average depth to shallow ground water Site-wide (Roux, 2003a).

Ground water data was collected in 1999, twice in 2000 and in 2001 representing four sampling events. For the purposes of this HHRA, only data collected in the three latest rounds (2000 (two events) and 2001) were summarized in each GW AOC (Roux, 1999a).

Consistent with USEPA (2001a) RAGS (Part D), chemicals of potential concern (COPCs) for each AOC were determined by comparing the maximum detected media-specific concentration to the applicable screening criterion following the frequency of detection analysis. If either the maximum detected concentration of a chemical in a given medium in a given AOC exceeded its respective screening criterion or if no pertinent screening criterion existed, then that chemical was retained as a COPC. However, Class A carcinogens were not screened out either by frequency or concentration. A second exception to this approach was for the Johnson and Ettinger vapor intrusion modeling analysis, where only the 5% frequency rule was applied, or if it was detected at least once in an AOC where less than 20 samples were evaluated. This was done since there are no suitable screening values for vapor concentrations.

For the screening of soils and sediment, USEPA Region III Risk Based Concentrations (RBCs) (USEPA, 2003) and Region IX's Preliminary Remediation Goals (PRGs) (USEPA, 2002b) were used, in part, as justification for whether or not BROS-related constituents in soil and sediment would be retained in the analysis for further evaluation. Both industrial and residential direct contact soil RBCs and PRGs were used in screening each AOC where exposure to soils by multiple types of receptors was expected, thus creating a more exact list of COPCs for each receptor. For instance, industrial PRGs and RBCs were used to screen chemicals for the construction worker, utility worker and groundskeeper, while residential PRGs and RBCs were used for trespassers, residents and restricted recreational users.

[1] It should be recognized that true surface exposures are likely represented by the top two inches of soil/sediment (USEPA, 1988). However, because limited analytical data were collected from the 2" zone, for data robustness, slightly deeper samples had to be included in the calculation of surface soil/sediment COPC.

For ground water, consistent with USEPA's (2002a) comments on the EPAR (Roux, 2002), Site ground water data were screened against the lower of Region III and Region IX risk-based residential tap water intake criteria (adjusting the chemical-specific non-cancer hazard index to 0.1). In the instance where a chemical lacked one or both Region III and Region IX tap water RBCs, the data were screened against the lower of Federal MCLs and New Jersey ground water quality standards, which are presented as "Applicable or Relevant and Appropriate" (ARAR) and "To Be Considered" (TBC) screening criteria in the HHRA

For surface water, chemicals were screened against available Federal Ambient Water Quality Criteria (USEPA, 2002c) and New Jersey surface water criteria (NJDEP, 2002).

E.5 DETERMINATION OF EXPOSURE POINT CHEMICAL CONCENTRATIONS FOR EACH COPC

Based on comments from USEPA (2002a) on the EPAR, the HHRA presents EPCs that rely upon 95th percent upper confidence limit (UCL) of the arithmetic mean for normally distributed data. The 95th percent UCL of the arithmetic mean of the log-transformed data is used for log-normally distributed data, or for data that fit neither a normal nor a log-normal distribution. In cases where this calculated value exceeds the maximum sample concentration for a given medium, the maximum detected concentration is utilized as the representative EPC. USEPA's ProUCL software was used to test the distribution for those data where the UCL did not exceed the maximum detected concentration.

E.6 EXPOSURE ASSESSMENT

Exposure assessment is the process of measuring or estimating the intensity, frequency and duration of exposure to an agent present in the environment (USEPA, 1989). For the BROS Site HHRA, potentially exposed populations that may have some contact with the BROS Site are defined and the exposure scenarios that are likely to occur in each AOC are described. The exposure pathways derived from soil, sediment, surface water and ground water associated with each current and potential future use scenario are presented and the specific exposure parameters and assumptions selected to derive the exposure estimates are outlined and discussed.

On BROS Property and areas on adjacent properties, the influences of the widespread occurrence of free and residual LNAPL (and associated chemical constituents) on exposure

estimates is substantial. The concentrations and estimated exposures associated with soils and shallow ground water are low, except where free or residual LNAPL is present (See Chapters 4 and 5).

In summary, receptors quantitatively evaluated in the HHRA included:

- Trespassing teenagers (on-Property surface soil exposure)
- Groundskeeper (on-Property surface soil)
- Construction worker (surface and subsurface soil and shallow ground water)
- Utility worker (surface and subsurface soil)
- Adult and child resident (off-Property shallow and deep ground water potable use)
- Adult and child agricultural (off-Property shallow and deep ground water spray irrigation)
- Adult and child recreators (surface water and sediments in CS and LTCS)

E.7 TOXICITY ASSESSMENT

For this assessment, chemical-specific toxicity factors available from USEPA's Integrated Risk Information System (IRIS) were incorporated. For chemicals where IRIS values were unavailable, provisional toxicity criteria developed through USEPA/NCEA or toxicity values available from the HEAST database were utilized in consultation with the USEPA. For the vapor intrusion evaluation, toxicity values included with the model (version 3, dated February 2003) or derived from IRIS (ORNL, 2003) were used. No toxicity criteria were available from these sources for the following chemicals: lead, acenapthylene, benzo(g,h,i)perylene, phenanthrene, 4-chloro-3-methyphenol, and *cis*- and *trans*- 1,3-dichloropropene. Following the 1 June 2005 meeting, a request was submitted to EPA to provide input on those chemicals that lacked CSFs or RfDs in IRIS, and those that lacked URFs or RfCs (for the vapor intrusion modeling). Since toxicity values were not made available by EPA prior to preparing this revised document, the potential risks from these chemicals were not evaluated in the revised HHRA. However, the potential risks from these compounds are likely to be significantly less than the

more abundant and widespread COPCs, which are quantified. The impact of these compounds and the likely underestimation of risk is discussed in the uncertainty section.

E.8 RISK CHARACTERIZATION

In this HHRA, cancer and non-cancer health risks were estimated for each exposure scenario for each AOC. Hypothetical cancer and non-cancer risk estimates were initially provided for upper-end reasonably maximum exposed (RME) individuals. In cases where RME risk results exceeded acceptable cancer and non-cancer risk benchmarks, central tendency exposure (CTE) calculations are provided to determine if more moderately exposed individuals would also exceed applicable risk benchmarks. Potential cancer risks are estimated by multiplying the exposures (doses) derived for each chemical by the chemical's cancer slope factor. For potential excess lifetime cancer risks, USEPA's acceptable risk range is between one-in-ten-thousand and one-in-a-million (1×10^{-4} to 1×10^{-6}). Cancer risks less than or equal to 1×10^{-6} are characterized as acceptable, without consideration of risk management alternatives. Potential non-cancer risks with a total hazard index (HI) of 1 or less is considered an acceptable level. It must be recognized that for the on-BROS Property and areas on adjacent properties, the influences of the widespread occurrence of free and residual LNAPL (and associated chemical constituents such as PCBs) on the risk estimates is substantial. The concentrations and estimated exposures associated with soils and shallow ground water are low, except where free and residual LNAPL is present (See Chapters 4 and 5 of RI).

E.9 RISK RESULTS AND CONCLUSIONS

Consistent with USEPA Superfund risk assessment methodology, this analysis has presented conservative upper-bound estimates of cancer and non-cancer risk. Each area of concern (AOC) was evaluated for potential current and foreseeable future human exposures. Values shown in bold in the summary tables provided in this section exceed the cancer or non-cancer risk thresholds.

Surface Soil Exposure by Trespassers and Groundskeepers on the BROS Property

The potential risks from incidental contact of surface and subsurface soils by site trespassers, were evaluated and the cancer and non-cancer risks are summarized for both receptors in the table below.

Area or AOC	Receptor	Exposure	Soil-Based	
			Cancer	Non-Cancer
Soil AOC BROS Property	Trespasser	RME	1.3E-07	1.8E-02
	Groundskeeper	RME	5.8E-07	1.8E-02
Soil Hot Spot 1	Trespasser	RME	7.8E-08	6.4E-03
	Groundskeeper	RME	4.9E-07	1.4E-02

Both cancer and non-cancer risks were determined to be acceptable for the trespasser and groundskeeper who might come in contact with surface soils. The CTE risks were not evaluated since the RME risks were below the cancer and non-cancer risk thresholds.

Soil Exposure by Utility and Construction Workers

The potential cancer and non-cancer risks for all of the evaluated site areas are summarized in the table below.

AOC or Area	Receptor	Exposure	Surface Soil-Based (0-0.5 ft)		Subsurface Soil-Based (0-6 ft)	
			Cancer	Non-Cancer	Cancer	Non-Cancer
Soil AOC BROS Property	Construction Worker	RME	6.6E-08	1.7E-02	2.4E-07	1.5E-01
	Utility Worker	RME	5.7E-09	1.5E-03	6.6E-08	4.9E-02
Soil Hot Spot 1	Construction Worker	RME	5.6E-08	1.4E-02	1.1E-07	1.7E-01
	Utility Worker	RME	4.8E-09	1.3E-03	3.7E-08	5.0E-02
Soil Hot Spot 2	Construction Worker	RME	NE	NE	7.4E-08	1.3E-01
	Utility Worker	RME	NE	NE	3.7E-08	6.5E-02
Soil AOC 3 (Debris/Fill Area)	Construction Worker	RME	NE	NE	8.7E-09	9.6E-04
	Utility Worker	RME	NE	NE	2.0E-09	3.2E-04
Soil AOC 5 (West Side of Property)	Construction Worker	RME	6.3E-09	7.7E-04	6.3E-09	7.7E-04
	Utility Worker	RME	1.6E-09	2.5E-04	1.6E-09	2.5E-04
Soil AOC 4 (South Side of Property)	Construction Worker	RME	5.2E-09	5.7E-04	5.2E-09	5.7E-04
	Utility Worker	RME	1.2E-09	1.9E-04	1.2E-09	1.9E-04
Soil AOC 2 (Drainage Swale)	Construction Worker	RME	6.8E-08	2.4E-02	3.5E-08	2.8E-02
	Utility Worker	RME	3.5E-08	2.8E-02	1.3E-08	1.3E-02

In some of these cases the surface soils (0 to 0.5 ft) were summarized separately from the subsurface soils (0 to 6 ft) since (a) the latter includes the surface soil results in the calculation of the EPCs, and (b) the dust inhalation soil EPCs were based on the subsurface soils only. The RME cancer and non-cancer risks were below their risk thresholds for the construction and utility workers that who might contact with surface or subsurface soil when conducting work activities in any of the soil AOCs. Because the RME exposures fell below the established risk thresholds, CTE exposures were not evaluated.

The potential risks to the construction and utility workers were based on a 100 mg/day soil ingestion rate and a dermal adherence factor for soils of 0.9 mg/cm^2. As alternatives, USEPA suggested that a soil ingestion rate of 330 mg/day (from USEPA, 2001d) and soil dermal adherence factor of 0.2 mg/cm^2 (USEPA, 2004a) be used. Although these would change the risks calculated from the soil ingestion pathway (increase the risk by a factor of 3.3 times) and the risks from the dermal pathway (decrease the risk by a factor of 4.5 times) the total soil cancer and non-cancer risks would still be below the threshold values.

Vapor Intrusion Assessment

Potential vapor exposure was assessed only under potential future-use conditions for the vapor intrusion pathway since there is no relevant exposure under current settings. Six potential exposure areas were evaluated, and the cumulative risk results are summarized in the table below.

Area or AOC	Exposure	LNAPL/Shallow Ground Water -Based		Soil-Based		Combined	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Soil Hot Spot 2	RME	**7.6E-06**	3.5E-02	**4.8E-06**	**1.6E+01**	**1.2E-05**	**1.7E+01**
	CTE	**1.3E-06**	2.1E-02	8.0E-07	**2.6E+01**	**2.1E-06**	**2.6E+01**
Soil Hot Spot 1	RME	**3.0E-03**	**2.5E+01**	**4.8E-06**	**2.9E+01**	**3.0E-03**	**5.4E+01**
	CTE	**5.0E-04**	**1.5E+01**	8.0E-07	**2.1E+01**	**5.0E-04**	**3.6E+01**
West Side Property, Off the BROS Property	RME	**2.0E-05**	4.6E-02	5.0E-08	2.7E-04	**2.0E-05**	4.7E-02
	CTE	**3.4E-06**	2.8E-02	8.4E-09	5.7E-04	**3.4E-06**	2.8E-02
South Side Property, Off the BROS Property	RME	**1.1E-05**	8.5E-03	2.0E-08	1.8E-07	**1.1E-05**	8.5E-03
	CTE	**1.8E-06**	5.1E-03	6.6E-09	1.1E-07	**1.8E-06**	5.1E-03
Remaining BROS Property (Excluding Former Lagoon Area),	RME	**7.7E-06**	2.0E-01	**1.2E-05**	**3.3E+00**	**2.0E-05**	**3.5E+00**
	CTE	**1.3E-06**	1.2E-01	**5.3E-06**	**2.5E+00**	**6.6E-06**	**2.6E+00**
Remaining BROS	RME	**2.4E-03**	**3.0E+00**	---	---	**2.4E-03**	**3.0E+00**

Area or AOC	Exposure	LNAPL/Shallow Ground Water -Based		Soil-Based		Combined	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Property Former Lagoon Area	CTE	**4.1E-04**	**1.8E+00**	---	---	**4.1E-04**	**1.8E+00**

Across the six evaluated areas, risk from benzene exposure was most frequently (5/6) above the cancer risk threshold, followed by total PCBs, TCE and vinyl chloride (all at 4/6). For the non-cancer risks, phenanthrene was most frequently (3/6) above the non-cancer risk threshold, followed by naphthalene, TCE and total xylenes (2/6).

Within a given exposure scenario, the largest number of cancer risks calculated above the risk threshold of $1x10^{-6}$ was for the former lagoon area (9), followed by Soil Hot Spot 1 (6). The highest total cancer risk was calculated for Soil Hot Spot 1. The remaining scenarios ranged from 0 to 4 cancer chemicals above the risk threshold.

For the non-cancer compounds, the largest number of non-cancer risks calculated above the risk threshold of 1 was from Soil Hot Spot 1 (7). Soil Hot Spot 1 also had the highest total non-cancer hazard quotient. The remaining scenarios ranged from 0 to 3 non-cancer chemicals above the risk threshold.

As stated, the evaluation of this pathway is hypothetical, since no buildings currently exist on the property or over the delineated plume, and the modeled results are based on many assumptions, including the size and the air exchange rate of the building. However, existing data on the nature and extent of contamination present in the subsurface suggest that the potential for vapor intrusion exists in the event that buildings were to be constructed.

Sediment and Surface Water Exposure

Potential risks from recreational exposure by residents (adults and children) to sediment and surface water from Cedar Swamp and Little Timber Creek Swamp were evaluated for this exposure pathway. Sediment and surface water upper-end (RME) exposure calculations for the lifetime recreator utilizing Cedar Swamp and Little Timber Creek Swamp resulted in no exceedances of cancer and non-cancer risk benchmarks, as shown in the table below.

Receptor	Exposure	Surface Water		Sediment		Combined	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Adult	RME	1.8E-07	2.4E-03	1.2E-07	1.1E-02	3.0E-07	1.3E-02
Child	RME	7.7E-08	3.8E-03	1.2E-07	4.0E-02	1.9E-07	4.4E-02
Adult + Child	RME	2.6E-07	6.3E-03	2.3E-07	5.1E-02	4.9E-07	5.7E-02

CTE risks were not calculated since the cancer and non-cancer RME risks were below their respective risk thresholds.

Based on these results, risks were determined to be acceptable for recreational users who might be in contact with sediments and surface water in both these systems.

Groundwater Exposure by Construction Workers

Hypothetical dermal exposure to shallow ground water by a construction worker in AOC 1A (on-Property shallow ground water) was evaluated and the cumulative risks are summarized in the table below.

Receptor	Exposure	GW - Based	
		Cancer	Non-Cancer
Construction Worker	RME	**2.0E-06**	**3.7E+00**
	CTE	4.6E-07	**1.7E+00**

Of the 20 chemicals evaluated for potential cancer risks and 44 chemicals evaluated for potential non-cancer risks, only the PCBs detected in proximity to ground water exceeded the cancer or non-cancer risk thresholds, as summarized below.

Chemical	Exposure	LNAPL/Impacted Shallow Water-Based	
		Cancer	Non- Cancer
Total PCBs	RME	**2.0E-06**	**4.0E+00**
Total PCBs	CTE	4.0E-07	**2.0E+00**

The RME cancer risk estimate is at the conservative end of USEPA's acceptable risk range (1 x 10^{-6} to 1 x 10^{-4}) and, thus, is practically *de minimis*. The non-cancer HI for the RME dermal contact construction worker in GW AOC 1A was 4.0, which therefore exceeded the benchmark HI of 1.0. CTE total shallow ground water contact risks for the construction worker totaled 2.0 (also exceeded the non-cancer risk benchmark). Therefore, shallow ground water impacted by wastes in soils and LNAPL on the BROS Property (AOC 1A) poses a potential health risk to construction workers who may have regular and prolonged contact with it[2]. Should protective gloves and other barrier clothing be worn to inhibit or prevent skin contact with AOC 1A shallow ground water, these risk estimates would diminish and may even be zero, as exposures approximate zero.

Recreational Use of Deep Ground Water (GW AOC 3)

Potential exposure to Deep Ground water in AOC 3 was evaluated for an adult and child who might ingest ground water from a fountain during recreational activities. This is a highly conservative exposure pathway given the existing deed restriction and other institutional controls that preclude such uses as well as the state ownership of the Property. The cumulative risk results across all chemicals are summarized in the table below for both of these receptors:

[2] Construction worker shallow ground water exposure to GW AOC 1c did not result in exceedances of cancer or non-cancer risk benchmarks, even for the most highly exposed RME receptor.

Receptor	Exposure	Ground Water - Based	
		Cancer	Non-Cancer
Adult	RME	**1.0E-04**	**1.5E+00**
	CTE	**3.0E-05**	4.1E-01
Child	RME	**7.5E-05**	**4.1E+00**
	CTE	**2.2E-05**	**1.2E+00**
Adult + Child	RME	**1.8E-04**	**5.6E+00**
	CTE	**5.1E-05**	**1.6E+00**

Chemicals exceeding their RME or CTE cancer and non-cancer risk benchmark(s) are shown in bold in the table below, for adults, children, and lifetime (adult plus child) exposure:

Chemical	Exposure	Ground Water - Based					
		Adult		Child		Adult + Child	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
1,2-Dichloroethane	RME	9.6E-07	1.6E-03	6.8E-07	4.7E-03	**1.6E-06**	6.3E-03
bis(2-Chloroethyl)ether	RME	**4.7E-05**	NC	**3.3E-05**	NC	**8.0E-05**	NC
Benzene	RME	9.5E-07	1.3E-02	6.7E-07	3.8E-02	**1.6E-06**	5.2E-02
Tetrachloroethene	RME	8.1E-07	4.7E-04	5.7E-07	1.3E-03	**1.4E-06**	1.8E-03
Trichloroethene	RME	**5.2E-05**	**1.4E+00**	**3.7E-05**	**3.8E+00**	**8.9E-05**	**5.2E+00**
Vinyl chloride	RME	**1.5E-06**	2.2E-03	**2.1E-06**	6.1E-03	**3.6E-06**	8.3E-03
1,2-Dichloroethane	CTE	2.7E-07	4.7E-04	2.0E-07	1.3E-03	4.7E-07	1.8E-03
bis(2-Chloroethyl)ether	CTE	**1.3E-05**	NC	**9.6E-06**	NC	**2.3E-05**	NC
Trichloroethene	CTE	**1.5E-05**	3.8E-01	**1.1E-05**	**1.1E+00**	**2.5E-05**	**1.5E+00**
Vinyl chloride	CTE	4.3E-07	6.2E-04	6.0E-07	1.8E-03	**1.0E-06**	2.4E-03

Agricultural Use of Deep Ground Water (GW AOC 4)

Agricultural uses of GW AOC 4 ground water were also quantitatively evaluated in this HHRA for residents (adults and children). The cumulative risk results across all chemicals are summarized below for the adult, child, and lifetime (adult plus child) receptors:

Receptor	Exposure	Ground Water - Based	
		Cancer	Non-Cancer
Adult	RME	**3.6E-06**	1.4E-02
	CTE	6.0E-07	2.3E-03
Child	RME	**1.0E-05**	1.8E-01
	CTE	**1.7E-06**	2.9E-02

Receptor	Exposure	Ground Water - Based	
		Cancer	Non-Cancer
Adult + Child	RME	**1.4E-05**	2.0E-01
	CTE	**2.3E-06**	3.1E-02

RME dermal contact and inhalation cancer risks for a child (representing the worst case (most conservative) exposure scenario) hypothetically exposed to GW AOC 4 irrigation spray water totaled 2 x 10^{-6}. Cumulative RME non-cancer child risks were below the HI benchmark of 1.0. The potential cancer risks were driven by the dermal exposure route, and three of the 10 evaluated chemicals [bis(2-Chloroethyl)ether, trichloroethene, and vinyl chloride] had cancer risks above the threshold of 1 x 10^{-6}. These cumulative and individual RME cancer risk estimates were at the conservative end of USEPA's acceptable risk range (1 x 10^{-6} to 1 x 10^{-4}), and, thus, is practically *de minimis*.

Ground water is classified by the State as a potable supply aquifer and therefore the ARAR is to consider ground water as a drinking water supply. However, since ground water that has been unaffected by BROS-related chemicals is readily available at this location (i.e., above the strata of concern), and the fact that an irrigation well is not currently in the location of MW 17D, future use of GW AOC 4 ground water should not pose a significant health risk.

Residential Use of Deep Ground Water (GW AOC 4)

The cumulative risk results across all chemicals are summarized below for the adult, child, and lifetime (adult plus child) receptors for residential use of deep groundwater (GW AOC 4):

Receptor	Exposure	Groundwater-Based					
		Ingestion		Showering		Combined	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Adult	RME	**3.0E-03**	**5.4E+00**	**2.7E-03**	**2.2E+00**	**5.7E-03**	**7.6E+00**
	CTE	**1.7E-03**	**3.1E+00**	**2.7E-03**	**2.2E+00**	**4.4E-03**	**5.3E+00**
Child	RME	**2.6E-03**	**1.8E+01**	**2.0E-02**	**1.8E+00**	**2.2E-02**	**2.0E+01**
	CTE	**1.5E-03**	**1.0E+01**	**2.0E-02**	**1.8E+00**	**2.1E-02**	**1.2E+01**
Adult + Child	RME	**5.6E-03**	**2.3E+01**	**2.3E-02**	**4.0E+00**	**2.8E-02**	**2.7E+01**
	CTE	**3.2E-03**	**1.3E+01**	**2.3E-02**	**4.0E+00**	**2.6E-02**	**1.7E+01**

Estimated cancer and non-cancer risks were above their respective thresholds for the both the RME and CTE cases, and for all the evaluated residential receptors, for all exposure pathways.

The estimated cancer and non-cancer risks for the individual chemicals are summarized in the table below for the RME case.

Chemical	RME Case Only – Adult Plus Child					
	Ingestion		Showering (Dermal Plus Inhalation)		Combined	
	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Arsenic	**1.9E-04**	**3.0E+00**	**5.6E-06**	2.2E-02	**1.9E-04**	**3.1E+00**
bis(2-Chloroethyl)ether	**4.7E-03**	NE	**2.1E-02**	NE	**2.6E-02**	NE
1,1,2,2-Tetrachloroethane	**2.5E-05**	1.5E-02	**2.3E-05**	6.3E-03	**4.8E-05**	2.2E-02
1,1,2-Trichloroethane	**2.0E-06**	6.5E-02	**2.2E-06**	3.3E-02	**4.3E-06**	9.8E-02
1,1-Dichloroethene	NE	5.3E-03	NE	1.9E-03	NE	7.2E-03
1,2-Dichloroethane	**5.2E-05**	2.1E-01	**2.4E-05**	8.8E-01	**7.6E-05**	**1.1E+00**
Benzene	**4.1E-05**	**1.4E+00**	**4.8E-05**	6.0E-01	**8.9E-05**	**2.0E+00**
Chloroform	NE	2.0E-01	NE	5.1E-02	NE	2.5E-01
cis-1,2-Dichloroethene	NE	7.4E-01	NE	5.3E-01	NE	**1.3E+00**
Tetrachloroethene	**8.3E-06**	1.1E-02	**1.4E-05**	5.9E-03	**2.3E-05**	1.7E-02
Trichloroethene	**2.7E-04**	**1.7E+01**	**1.9E-04**	**1.4E+00**	**4.6E-04**	**1.8E+01**
Vinyl chloride	**3.3E-04**	7.9E-01	**9.0E-04**	5.0E-01	**1.2E-03**	**1.3E+00**

Three chemicals, TCE, vinyl chloride, and BCEE comprise more than 95 percent of the total Site-related RME cancer risk. While arsenic was evaluated and provided on the summary table, it was found to be not Site-related (see Chapters 4 and 5 of RI). About 95% of the non-cancer RME risk was attributable to TCE, arsenic, benzene, vinyl chloride, and cis-1,2-dichloroethene.

The combined CTE risk estimates were virtually identical to the RME risk estimates, as the inhalation of shower vapor dominates the risk estimates. This was because the vapor inhalation analysis could not support reduction in any of its exposure factors, while certain exposure factors for the ground water ingestion risk calculation were modified to reflect CTE-type exposure. The same chemicals that dominated the RME risk estimates also dominated the risk estimates for the CTE case.

It should be noted, however, that this analysis used steady state (non-diminishing or attenuating) ground water concentrations, and the concentration used was the maximum value from a single sampling location MW 17D while unaffected ground water is readily available at

that location (above the strata of concern). Because there are no residences at the location of MW-17D, the ground water use risk estimates presented herein are purely hypothetical. Ground water withdrawn from some areas of the base (bottom 15 feet) of the Upper Middle PRM and consumed as potable would pose an unacceptable risk to human health. However, as recognized in the approved CEA/WRA, the distribution of BROS COPCs above acceptable risk levels and NJ GWQSs is highly limited vertically and extends over a relatively limited area horizontally beyond the I-295 right-of-way and LTC/LTCS. The Upper PRM south of I-295 is unaffected by BROS-related constituents and can provide an adequate supply for agricultural and residential uses currently and in the future. A confining layer and the upper portion of the Upper Middle PRM provide a barrier and a margin-of-safety between the Upper PRM and the CEA/WRA at the base of the Upper Middle PRM. Consequently, the risks associated with ground water AOC 4 are hypothetical risks because a viable water supply remains and there are no ground water users in AOC 4.

Potential Exposures Across Multiple AOCs

In the unlikely event that a person might be exposed to COPCs across more than one AOC, exposure and risk estimates would be higher than that presented for the specific individual AOCs. The BROS HHRA evaluates three possible combinations of cross-area exposures – (1) a person trespassing on the BROS Property, drinking water from a hypothetical fountain (withdrawing water from Ground water AOC 3) situated near Swindell Pond, and recreating in LTCS, (2) a person living near the BROS Property using ground water from AOC 4 for potable as well as agricultural irrigation purposes, and recreating in LTCS, and (3) a commercial worker working in a building situated on the BROS Property (Hot Spot) and exposed to BROS Property-related vapors, drinks water from a fountain drawing water from AOC 3, and recreating in LTCS. In all cases, the cumulative risks across the individual pathways exceeded the cancer and non-cancer risk thresholds for all three scenarios (See Section 5.12 for detailed summaries). Despite the potential additivity of risks over several AOCs, "hot spot" AOCs still drive risk issues, as their overall contribution to total cancer risk and non-cancer hazard index overshadows the lesser significant AOCs.

Finally, the BROS Property is advancing to the Feasibility Study phase within the Superfund process. The USEPA is continuing to remove the free LNAPL and evaluate the option for additional removal of soils and drum remnants. Based on the Wetlands FS, removal of elevated COPCs in hydric soils/sediments in LTCS including the areas that may pose some risks to

human health is likely. In addition, the Phase 2 FS (soils, LNAPL and ground water) evaluated alternatives for remediation of the COPCs located in soil, LNAPL and ground water beneath and near the BROS Property. Aggressive remedial alternatives are the likely result of the analysis. The sum total of these remedial actions will further ensure that the likelihood of individuals coming in contact with BROS-related constituents over time will diminish, and with this reduction in exposure to COPCs, risks (real and hypothetical estimates) will also diminish.

HUMAN HEALTH RISK ASSESSMENT

1.0 INTRODUCTION

AMEC Earth & Environmental Inc. (AMEC) prepared this baseline human health risk assessment of the BROS Superfund Site in support of site investigation and remedial activities. This evaluation is an integral component of the BROS Technical Committee Remedial Investigation and analysis to protect human health and the environment at the BROS Site. The starting point for this risk assessment is the use of reliable scientific data collected from environmental media at the BROS Superfund Site that reflect current conditions and historical trends. The risk assessment incorporates a large media sampling database, state-of-the-art fate and transport modeling, and where appropriate, site-specific exposure assessment parameters.

Risk assessment, as defined by the National Academy of Sciences (NAS), is the characterization of the probability of potentially adverse health effects resulting from human exposures to environmental hazards. In essence, it is the systematic evaluation of the probable health effects posed by a particular substance or mixture of substances present in one or more environmental media. The framework to quantify such adverse health effects was established by the NAS in 1983 and subsequently adopted by the USEPA. The following assessment corresponds to the basic elements of scientific risk assessment: toxicity assessment, dose-response assessment, exposure assessment, and risk characterization (NAS, 1983).

In conducting this risk assessment, the following USEPA guidance has been considered:

- *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A) - Interim Final.* (USEPA, 1989);
- *Final Guidelines for Exposure Assessment* (USEPA, 1992a);
- *Guidance on Risk Characterization for Risk Managers and Risk Assessors* (USEPA, 1992b);
- *Supplemental Guidance to RAGS: Calculating the Concentration Term* (USEPA, 1992c);
- *Guidance for Risk Characterization* (USEPA, 1995a);
- *Exposure Factors Handbook* (USEPA, 1997a);
- *Proposed Guidelines for Carcinogen Risk Assessment – Interim Final* (USEPA, 1999);

- *Risk Assessment Guidance for Superfund: Volume 1, Part D. Standardized Planning, Reporting and Review of Superfund Risk Assessments - Final.* (USEPA, 2001a);
- *Risk Assessment Guidance for Superfund Volume I, Part E. Supplemental Guidance for Dermal Risk Assessment* (USEPA, 2001b); and
- *Risk Assessment Guidance for Superfund: Volume III, Part A. Process for Conducting Probabilistic Risk Assessment* (USEPA, 2001c).

In summary, this HHRA was prepared to fulfill the requirements of a baseline HHRA as outlined by USEPA in its *Risk Assessment Guidance for Superfund (RAGS)* (USEPA, 1989) and in the subsequent guidance and policy documents cited above. Moreover, as articulated in the USEPA-approved *BROS Phase 2 RI/FS Work Plan* (WP; Roux, 1999a), this human health risk assessment was designed to (1) provide the information necessary to support an informed risk management decision with regard to the ground water and wetlands for the protection of human health; (2) aid in the development of actions that lead to a reduction in overall risks; (3) recognize the CERCLA remedial actions already completed at the Site; and, (4) provide the baseline evaluation of risks for comparison to risk reduction measures considered in the FS.

1.1 OVERVIEW

The Baseline Risk Assessment was conducted in multiple steps and included an interim deliverable, the Exposure Pathway Analysis Report (EPAR; Roux, 2002). This HHRA builds upon the exposure analysis framework set forth by the *BROS Phase 2 RI/FS Exposure Pathways Analysis Report (*EPAR; Roux, 2002), and reflects subsequent discussions with USEPA following its review of this document. The EPAR provided a preliminary assessment of on- and off-property BROS-related chemicals in relation to the potential for human exposure under current and reasonably foreseeable future land use conditions.

The risk assessment approach developed for the BROS Site emphasizes the following elements:

- A detailed conceptual model of the Site;
- Background conditions in soils, surface water, and ground water;

- Site-specific characterization of probable exposure frequency and duration by determining current and future receptor activities in various portions of the site;

- Sampling at the locations of actual and potential exposure points in a manner that will yield representative concentrations;

- Estimating exposure point concentrations using the most recent and representative data available for each area. Although the risk assessment evaluates potential risk now and in the future if no remedial action is taken, the BROS Site Phase 2 RI/FS is predominantly a retrospective study, since the release of contaminants occurred primarily in the past. The contaminant concentrations used in this risk assessment therefore represent current levels and do not take into account the predicted decreasing concentrations of parent compounds and increasing concentrations of degradation products in the future. The potential underestimation of the exposure concentrations is discussed in the uncertainty section;

- Evaluating risks posed by the entire site, in addition to areas of concern or hot spots which are distinguished by differing chemical types, concentrations, sources of contamination, spatial or temporal variability, sampling methods employed and/or other relevant factors;

- Realistic data quality objectives based on site-specific conditions; and

- Recognition that there can be significant interrelationships between the human health risk assessment and the ecological risk assessment, especially when the results of both baseline risk evaluations are taken into consideration in the Feasibility Study.

Consistent with this approach, Objective 8 in the Work Plan emphasized the importance of determining representative exposure point concentrations and characterizing potential receptors. The details of Objective 8 are presented below and include reference to relevant Work Plan Addendums adopted during the course of the Phase 2 RI.

To accurately estimate the exposure point concentrations and the risks arising from those concentrations, the exposure point concentrations must be specifically measured in a manner that can be related directly to current or potential future receptors (USEPA, 1998a). Exposure

estimates must be conservative but within a realistic range of exposure, where unlikely exposure scenarios are eliminated from consideration consistent with USEPA policy and guidance (USEPA, 1995a). In considering land use and ground water use, Superfund exposure assessments most often classify land use into one of three categories: (1) residential, (2) commercial/industrial, and (3) recreational; ground water use is classified as potable or non-potable use (USEPA, 1995b).

In May 1997, the Settling Defendants reached an agreement with the owners of the BROS Property that included three perpetual deed restrictions in the form of Declaration Restrictive Covenants that were promptly established for the BROS Property, including the Pepper Building, the former Lagoon and former Process Areas. These restrictions are necessary to maintain the integrity and ensure the protectiveness of the Phase 1 remedy, and are consistent with New Jersey prohibitions)N.J.A.C. 7:26-2A.6 (i)(1)) of residential construction or potable ground water supplies within 150 feet of a solid waste disposal unit (i.e. the lagoon incineration ash). These deed restrictions are currently in place and properly recorded. The provisions of the restrictions include:

- Future use of the property excludes residential use and limits other uses to non-retail commercial and/or industrial use. These uses are consistent with the use at the time the release of hazardous substances began.
- All subsurface activities (e.g., digging) are prohibited without prior written approval of the USEPA and NJDEP.
- The installation and/or use of any ground water wells at the Site is prohibited without prior written approval of the USEPA and the NJDEP.

Beyond the BROS Property boundary, potential for ground water use throughout the Site is limited because nearby residents have been connected to the municipal water supply. No private potable supply wells have been identified downgradient of the BROS property within and adjacent to the Classification Exception Area (CEA) and Well Restriction Area (WRA). A comprehensive survey of ground water use throughout the CEA/WRA and beyond its perimeter has been conducted and maintained during the last several years as part of the water line extension work. Moreover, CEA and WRA designations have been established for portions of the Water Table and the UMPRM aquifers (Roux, 2002b). The purpose of establishing the CEA/WRA at the BROS Site was to provide notice that the constituent standards for portions of the Water Table and the UMPRM aquifers are not met and that designated aquifer uses in localized areas are restricted unless special precautions or treatment is employed prior to water use. A CEA/WRA designation was established for the BROS Site because Site-related

chemical constituents have been detected in ground water at concentrations that exceed the NJDEP Ground Water Quality Criteria (GWQC) (N.J.A.C. 7:9-6.7).

An initial CEA/WRA report was submitted to the New Jersey Department of Environmental Protection (NJDEP) in April 1999 (Roux, 1999i) and approved on June 3, 1999.

An updated CEA/WRA report for the Site was submitted to the NJDEP in February 2002 and subsequently approved. In combination, these institutional controls provide overlapping assurance of protection and supplement remedial actions and engaineering controls.

Data and Technical Evaluation Needs:

- Identify current and probable future ground water users that have the potential to be exposed to Site-related contaminants.
- Determine representative human health risk assessment exposure point concentrations across various portions of the Site in a manner consistent with current and future land use and/or water use.
- Identify ground water users and well configurations at the BROS Site. Sample local private wells to evaluate the current extent and gradients of Site-related COPCs in ground water and to assess representative COPC concentrations at potential receptor wells.
- Annually evaluate the planned future use of land, especially land development proposals in the vicinity of the Site by contacting the Logan Township Planning Board periodically throughout the duration of the Phase 2 RI/FS.
- Conduct a screening level evaluation to determine if there is need to conduct a more detailed analysis within the farm located adjacent to the west side of the BROS Property to determine if any risk management measures may be appropriate. The scope of the screening level evaluation was detailed in *Work Plan Addendum No.3, Screening Level Analysis of Orchard Fruit Near the BROS Property* (Roux 2001a).
- Determine the concentrations of some BROS-related COPCs in sediment, forage fish and game fish collected from both Little Timber Creek adjacent to Cedar Swamp and from the reference area. Fish tissue sampling was described in *Technical Memorandum No.6, Screening Level Fish Tissue Analysis for Selected Chemicals in Little Timber Creek Adjacent to Cedar Swamp and Route 130* (Ogden, 2000d); *Technical Memorandum No.4 Update, Ecological Risk Assessment/Risk Management Evaluation* (Ogden, 2000b); and the Ecological Risk Assessment Report (AMEC, 2003a).
- Determine the potential bioavailability of some BROS-related COPCs relative to sediment concentrations and reference area concentrations. Bioavailability assessments were described in *Technical Memorandum No.6, Screening Level Fish Tissue Analysis for Selected Chemicals in Little Timber Creek adjacent to Cedar Swamp*

and Route 130 (Ogden, 2000d); *Technical Memorandum No.4 Update, Ecological Risk Assessment/Risk Management Evaluation* (Ogden, 2000b); and the Ecological Risk Assessment Report (AMEC, 2003a).

- Evaluate the bioavailability of COPECs to fish and small mammals by testing COPEC concentrations in tissues.

Other details of the HHRA scope of work are included in the Phase 2 RI/FS Work Plan (Roux, 1999).

1.2 SITE BACKGROUND

1.2.1 Site Description

The BROS Superfund Site (Site) is located in Logan Township, Gloucester County, New Jersey, approximately one mile east of the town of Bridgeport and west of the divergence of U.S. Route 130 and Interstate 295 (Figure 1-1). The BROS Site is located two miles south of the Delaware River. As defined in the Consent Decree (USDC, 1997), the Site includes the aerial extent of contamination relating to the release or threatened release of hazardous substances and all suitable areas in close proximity to the contamination necessary for implementation of response activities, which includes in its entirety the BROS Property where the operations occurred that led to the release of hazardous substances (Figure 1-1).

The BROS Property formerly contained a 13-acre waste-oil lagoon (a former sand quarry pond). In 1972, following heavy rains associated with Hurricane Agnes, the lagoon overflowed into the adjacent Little Timber Creek Swamp. Little Timber Creek Swamp (LTCS) borders the property to the east and north while Cedar Swamp (currently a red maple swamp since logging in the last century removed the cedar trees) extends from north of Route 44 to the Delaware River (Figure 1-2). Much of the surrounding land is swamp with surface water flowing diffusely northward to the river, interspersed with some commercial, agricultural, and a few residential properties on upland areas. Constructed drainage-ways direct surface water under roadways and around Cedar Swamp. The BROS property has been restored to an upland grass habitat and is bordered to the north by Cedar Swamp Road and U.S. Route 130 which traverse Cedar Swamp on an earthen embankment. Little Timber Creek Swamp lies to the east and north of the BROS property from south of Interstate 295 up to Route 44 (Figure 1-2). Downstream of Route 44, the swamp and drainage channels are freshwater tidal streams. Gaventa Pond and Swindell Pond lie to the south and southwest separated by a peninsula with remnants of the former access

roads and sand processing areas that were used when the area was mined during the former sand quarry operations. A commercial farm is operated to the west of the BROS property (Figure 1-2).

The BROS Property and surrounding area are relatively level topographically. The BROS Property is generally covered with topsoil and grass, except along the northern boundary, which is the location of a gravel driveway and parking area, and where some structures are located. The BROS Property includes:

- a former 13-acre waste oil and wastewater lagoon, which has been filled with incinerator ash, lime and soil as part of remedial activities, situated along the southern and western Site boundaries;
- a former storage tank farm and process areas situated between the former lagoon and the northern property boundary along Route 130;
- a low-lying area between the former lagoon and the marsh situated along the eastern edge of the Property;
- a decommissioned aqueous wastewater treatment system (AWTS) that was used to treat liquids pumped from the lagoon during remedial activities;
- two office trailers;
- a warehouse building situated near Cedar Swamp Road and referred to as the Pepper Building (Photograph 1-1; 1-2);
- areas containing debris fill materials that are situated along the southern and eastern edges of the property, adjacent to Gaventa Pond, Swindell Pond, and Little Timber Creek Swamp; which, along with the former lagoon, was disturbed during the former sand quarry operations, as well as the BROS water/oil management operations (including former small lagoons and drum burial areas); and
- an area of ground water beneath the property containing BROS-related chemicals, which extends to the southeast of Route I-295 (Figure 1-3).

1.2.2 Site Ownership/Operations

Since the early 1980s, the primary activities at the Site have been remedial investigations and remedial actions undertaken to address the environmental concerns associated with the Site. In December 1984, the USEPA issued a Record of Decision (ROD) for the BROS Site. Remedial Actions subsequently performed in accordance with the ROD included:

- The design and installation of a potable water extension line to service potentially impacted residences in the vicinity of the Site. The work was completed under the oversight of the NJDEP between 1985 and 1987 (Personal communication with Michael McIntyre of the Pennsgrove Water Supply Company, June 22, 1998, as cited by Roux, 2003a).

- The demolition and removal of on-Property buildings and approximately 100 tanks and process vessels used to store hazardous wastes in the tank farm and the off-Site disposal of approximately 400,000 gallons of oils and sludges, 5,200 floating and buried drums, and 4,300 tons of debris. The work was conducted between 1986 and 1988 under the oversight of the USACOE.

The construction of an on-Site aqueous wastewater treatment system and permitting of an on-Site transportable incinerator. The incinerator was used for the thermal destruction of over 172,000 tons of material including 138,350 tons of underlying lagoon sediments and sludges, 3,850 tons of lagoon oil, 12,550 tons of lagoon levee material, 4,250 tons of soil reportedly as a result of the lagoon overflows in previous years, and 13,000 tons of debris (USACOE, 1996). During excavation of the lagoon, over 190 million gallons of ground water was removed from the lagoon by pumping and treated using the AWTS prior to discharge to the Little Timber Creek. The lagoon was backfilled with sand, lime-treated ash, and stone to grade and is currently covered by topsoil and grass. The design and remediation activities for the lagoon remedial actions were performed between 1988 and 1996 under the oversight of the USACOE.

In 1990, in addition to the Phase 1 ROD activities, drums of hazardous materials were removed from the Pepper Building by USEPA's Removal Branch.

In 1990 and 1991 some initial Phase 2 RI/FS activities were conducted by CH_2M Hill, under contract to the USEPA, to define the extent of soil and ground water contamination and to develop and evaluate remedial alternatives for the BROS Site (CH2M Hill, 1996). CH_2M Hill conducted aquifer testing, tidal studies, surface water, sediment and ground water sample collection, and installed 22 wells. Eighteen wells were installed as two-well clusters and the remaining four wells were installed at locations and depths selected to augment the well clusters or address data gaps in the existing monitoring well network. Four of the clusters consisted of monitoring wells screened in the water table (Upper PRM) and Upper Middle PRM aquifers. Five of the clusters were comprised of couplets installed in the Upper PRM and the Lower Middle PRM aquifers. In 1993, CH_2M Hill installed eight additional wells downgradient from the existing monitoring well network to characterize the extent of ground water contamination. Wells were installed in pairs and screened in the Upper PRM and Upper Middle PRM aquifers.

In September 1996, the Settling Defendants signed the BROS Consent Decree and agreed to implement the Phase 2 RI/FS activities as well as the ground water and wetlands remedial actions. The BROS Technical Committee, which is composed of representatives of the Settling Defendants, retained Environmental Liability Management, Inc. to serve as Project Coordinator. Roux Associates, Inc. was contracted by the BROS Technical Committee to develop and implement the additional Phase 2 RI/FS activities, detailed in the USEPA-approved Work Plan (Roux, 1999).

Between November 1996 and February 1997 the USACOE, under the oversight of the USEPA, performed a Phase 3 soil investigation in the former Process and Tank Area (USEPA, 1998). Soil borings were reportedly completed to evaluate the potential presence of buried drums or debris based on a geophysical survey performed by USEPA contractors.

On June 8, 1999 the USEPA approved the *BROS Phase 2 RI/FS Work Plan* (Roux, 1999a) and *Field Operations Plan* (Roux 1999b). All field work and the Treatability Study were completed by December 2003. Starting in late 2001, USEPA contractors implemented drum removal and free LNAPL recovery activities at the Site utilizing the USEPA BROS Special Account fund established through the BROS Consent Decree. An estimated 300 drums were removed from the Debris/Fill Areas. Approximately 100 additional drums or drum carcasses were encountered in an area southeast of the Pepper Building during the construction of an LNAPL recovery trench in June 2002. The USEPA contractors removed approximately 16 of the drums from this area, and are evaluating options for the removal of the remaining drums and drum carcasses from this area. In addition to the drum removal activities, the USEPA contractors are conducting free LNAPL recovery activities at the Site. These work activities include the installation of 16 recovery sumps, five product recovery pumps, and approximately 25 piezometers. Other RI-related activities included extension of municipal water supplies to all residents in the vicinity of the Classification Exception Area/Well Restriction Area (CEA/WRA) and acquisition of perpetual access rights and deed restrictions on the south side property through an agreement that transferred the property to the New Jersey Green Acres property.

1.2.3 Chemical Characteristics of Source Areas and Soils

Remaining source areas are divided into primary (drums, tanks, and LNAPL) and secondary sources (contaminated soils and sediment) that can result in additional contamination of

environmental media due to leaching or transport with surface water or air. The secondary sources are described below in Section 1.3, along with the other soil Areas of Concern (AOCs). The chemical analysis results for sources and soils are summarized in the following sections.

AOCs have been established for soils and ground water (Refer to Figures 1-4; 1-3 and 1-5). The AOCs were developed based upon relevant exposure scenarios, and from the distribution and gradients of BROS-related chemicals detected at the Site. Overall, the distribution and concentration gradients of BROS-related chemicals have been well established through the iterative sampling program completed under the approved Phase 2 RI/FS Work Plan, and subsequent amendments.

The AOCs relate to the updated conceptual site models for soils and ground water, as presented in the Phase 2 RI/FS (BROS Technical Committee, 2006), and will be utilized throughout this HHRA and the FS, as they represent the current understanding of Site conditions based upon the Phase 2 RI data and data from previous investigations.

1.3 Risk Assessment of Areas of Concern and Hot Spots

The risk assessment analysis presents a deterministic or point estimate characterization of potential upper-bound human health risks associated with BROS-related constituents, consistent with USEPA RAGS Part A (USEPA, 1989) and other USEPA guidance (USEPA, 1992a; 1992b; 1992c; 1995a; 1997; 1998; 2001a; 2001b; 2001c). Its primary purpose is to aid in the selection of site remedial measures that result in risk-reduction consistent with the National Contingency Plan (NCP).

The BROS HHRA was prepared in conjunction with the previously submitted (2002) EPAR (Roux, 2002). The EPAR, consistent with the BROS Consent Decree (1996) and USEPA approved Work Plan (Roux, 1999), provided justification in support of evaluating exposures on the basis of Areas of Concern (AOCs) and Hot Spots by citing USEPA RAGS Part A Guidance (1989)), which recommends grouping exposures by AOCs when they:

- have different chemical types;
- have different concentrations or hot spots;
- are a release source of concern;
- differ from each other in terms of the spatial or temporal variability of chemical;

- must be sampled using different equipment; and/or
- are more or less costly to sample.

AOCs were distinguished consistent with the above six USEPA-defined criteria (EPAR, 2002), chiefly due to the distribution of Site-related chemicals over a large area, both horizontally and vertically. The supporting rationale for the identification of the AOCs is found throughout the RI and has been compiled and summarized in Chapter 4 (Section 4.4 of the RI). Accordingly, the HHRA focuses on an evaluation of risks posed by each discrete AOC, and will consider (and quantify) cumulative risks as part of the uncertainty analysis where overlap among exposures may be possible across two or more AOCs.

Eleven AOCs (Figures 1-3, 1-4, and 1-5) emerged as a result of the various media investigations and through discussions with USEPA. These AOCs include:

- Soil AOC BROS Property and Shallow Ground Water (GW) AOC-1A (Excluding Hot Spots 1 & 2)
- Hot Spot 1 (Soil AOC 1, GW AOC-1A) on the BROS Property
- Hot Spot 2 (Soil AOC 6, GW AOC-1A) on the BROS Property
- Debris/Fill Area (Soil AOC 3, GW AOC-1A) on the BROS Property
- West Side of Property (Soil AOC 5, Shallow GW AOC-1B)
- South Side of Property (Soil AOC 4, GW AOC-1C)
- Drainage Swale Adjacent to the BROS Property (Soil AOC 2, GW AOC-1D)
- Vapor Exposure AOCs
- Deep Ground Water (below 40' of Ground Surface) AOCs
- Wetland (Surface Water and Sediment) AOCs
- Cedar Swamp/Little Timber Creek Channel AOC

Estimates of receptor-specific exposures and risks were completed for each of the AOCs identified above and are discussed in greater detail in sections to follow.

1.4 ORGANIZATION OF RISK ASSESSMENT REPORT

While the HHRA is presented in the form of a stand-alone report, it has been prepared in concert with the Final BROS Phase 2 RI/FS Report (BROS Technical Committee, 2006). Thus,

details on media sampling fate and transport dynamics, and proposed potential remedial options are laid out in the Final BROS Phase 2 RI/FS Report.

Section 2.0 of the HHRA presents the results of a screening-level analysis of AOC and media-specific chemicals of potential concern (COPC). Chemicals that are not screened out based on USEPA-accepted screening criteria and procedures advance to the quantitative analysis stage of the human health risk assessment process. Section 3.0 presents an analysis of potential exposures under current and reasonably foreseeable future use assumptions for the BROS property and its environs, taking into consideration the previously discussed institutional controls (deed restrictions) and the long-term (40+ year) nonconforming industrial land use of the BROS Property. Section 4.0 presents a summary of toxicity criteria used in the quantitative analysis as well as documentation for the source(s) of each factor. In Section 5.0, quantitative risk estimates are provided for receptors identified in Section 3.0. Section 5.0 also contains a qualitative discussion of potential exposure pathways for which quantification was not necessary or meaningful given the low frequency and duration of the potential exposure, as well as a discussion of key uncertainties that factored into this analysis. Finally, Section 6.0 contains the references cited throughout the report.

2.0 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCS)

Data collected as part of the Phase II RI/FS constituted the majority of the data used in the HHRA. Historical data were used to supplement the current data, where necessary, provided that it underwent data validation review and its usability was verified.

Media sampled at the Site include soils, ground water, surface water, sediment, LNAPL, drum wastes, lagoon residuals, biota (fish and small mammals) and fruit (peaches). Samples collected at the Site were analyzed for a variety of geochemical and geotechnical parameters to support remedial decision-making. Principally, samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH) and metals. The data management for the BROS Site was performed using both MS-Access® and MS-Excel®. Sampling data for the entire Site are maintained in a single master database that includes detailed information on all samples collected. The following list details information within the master database that is relevant to the risk assessment:

Sample ID
Date sampled
QA information
Analyte chemical class
Media
Analyte
Concentration
Laboratory qualifiers
Validator qualifiers
Depth of sample (ft)

The following sections describe the process of identifying COPCs within each of the AOCs presented above, as well as the determination of the chemical concentrations associated with these COPCs for use in the HHRA. As noted on page 5-20 of RAGS (USEPA, 1989), *"Carrying a large number of chemicals through a quantitative risk assessment may be complex, and it may consume significant amounts of time and resources."* Thus, the goal of the COPC screening process is to screen out those chemicals that are of low toxicity and persistence in the environment and for which their elimination would not be predicted to have a meaningful impact on the overall risk estimates for the Site.

2.1 GENERAL DATA COLLECTION/EVALUATION CONSIDERATIONS

Data quality overall was high in part because project-specific sample collection and analytical methods and cleanups were employed, as described in the approved Work Plan (Roux, 1999a), the *Phase 2 RI/FS Sampling and Analysis Plan* (Roux, 1999c), the *Phase 2 RI/FS Quality Assurance Project Plan* (Roux, 1999d) and in *Technical Memorandum No. 2 – Analytical Method Development Studies* Roux, 1999e). Data validation comments were routinely favorable, and focused on methods to enhance data usability consistent with USEPA guidance. The data for each medium were divided into their respective AOCs. Within each AOC in each medium, a series of MS-Access® queries were used to analyze[3] and process the data for use in the risk assessment. Figure 2-1 represents this process conceptually.

[3] This included statistical analysis of the data per USEPA (1989, 1992c) guidance as well as grouping of data by AOC and media.

Evaluation of Soils and Sediment Data

Data within each soil/sediment AOC were evaluated from the perspective of the potential current or future contact that individuals may have with the soil or sediments in question (specific soil/sediment sampling locations and their associated data are summarized in Tables 1-1 and 1-2). For surface soil/sediment, the top six inches tended to be the cutoff in summarizing sampling data for the purpose of evaluating potential health risks due to COPC at the surface.[4] For subsurface soil, a limiting depth of six feet below ground surface was used in developing COPCs for subsurface soil. This six-foot depth limit corresponds approximately to the typical average depth to shallow ground water Site-wide (Roux, 2003a). Potential human contact with subsurface soil deeper than six feet (on average) would not be possible due to the presence of shallow ground water Site-wide. The six-foot bottom depth was used for all subsurface soil AOCs, except for Soil AOC 6, where the cutoff was extended to seven feet to improve data robustness for those areas that have smaller sample sizes. In one instance, Soil AOC 6 had two samples with bottom depth six feet or less (PB-3/SO/3-4 and PB-41/SO/5-5.5). Using two other samples with depth intervals of 6-7 feet, Soil AOC 6 now includes four samples instead of two. Moreover, in checking the two wells in Soil AOC 6, the average depth to water is 6.97 feet, which falls within that seven-foot range. A similar extension of bottom depth maximum from six feet to seven feet increases the sample size from eight to twelve samples.

Evaluation of Ground water and Surface Water Data

For ground water and surface water data, both filtered and unfiltered results were reported for metals (See Tables 1-2 and 1-3). For the purposes of this HHRA, only unfiltered data were used in calculating potential risks of exposures to ground water and/or surface water, as this is more consistent with the exposures that are being modeled. Any potential for overestimation of risk associated with using unfiltered data will be discussed in the uncertainty section.. In addition, ground water data was collected in 1999, twice in 2000 and in 2001 (supplemented by additional sampling in 2003); representing four sampling events. For the purposes of this HHRA, only data collected in the three latest rounds (2000 (two events) and 2001) were summarized in each GW AOC (Roux, 1999a).

[4] It should be recognized that true surface exposures are likely represented by the top two inches of soil/sediment (USEPA, 1988). However, because limited analytical data were collected from the 2" zone, for data robustness, slightly deeper samples had to be included in the calculation of surface soil/sediment COPC.

Evaluation of Tentatively Identified Compounds (TICs)

A relatively large number of tentatively identified compounds (TICs) were detected at the BROS Site, especially in the subsurface soils and ground water beneath the BROS Property. However, the vast majority of these compounds are high molecular weight petroleum compounds that are by-products of the used oil recovery operations on the property. These compounds, which are non-aromatic and not chlorinated, sulfonated or nitrogenated, generally exhibit low acute and chronic toxicity, compared with the chlorinated solvents, PCBs, and BTEX compounds detected at the BROS Site. In addition, as discussed in RAGS (USEPA, 1989), both the identity and reported concentration of a TIC is questionable, since the instruments are not calibrated to identify these compounds.

Based on their low frequency of detection and low concentrations, assumed low relative toxicity, and limited distribution compared with the identified compounds of concern, TICs are not evaluated further in the HHRA.

Evaluation of Essential Nutrients

As part of the chemical screening in the HHRA, an evaluation of essential nutrients was conducted per USEPA guidance (RAGS Section 5.9.4, p. 5-23, USEPA, 1989). This analysis, which follows, resulted in the elimination of potassium, sodium, magnesium and calcium from further consideration in the HHRA.

The maximum concentration of sodium in ground water is 559 mg/L. Ingestion of two liters per day of ground water from the Site (a highly improbable event) would result in a daily sodium intake of 1,118 mg. This concentration is below the 2,400 mg per day that is typically recommended as part of a reduced sodium healthy diet (ADA, 1996). It should be noted that the majority of the population ingests well over 2,400 mg per day of sodium with little or no health consequence.

Magnesium is present in ground water at a maximum concentration of 317 mg/L. Ingestion of two liters of ground water from the Site would result in a daily intake of 634 mg. The recommended dietary allowance (RDA) for magnesium, which is the average daily dietary intake that is sufficient to meet the nutrient requirements of the human body, ranges from 310 mg to 410 mg, depending on age and gender. Although the estimated intake of magnesium associated with ground water from the Site might exceed the RDA if only ground water were

consumed on a continuous basis (again, a highly improbable event on a sustained basis), it should be noted that the RDA is considered to be a minimum requirement and not an upper limit. Magnesium is a component of vitamins (at concentrations equal to the RDA), and is frequently recommended for persons taking medications (such as diuretics) that deplete the body of needed magnesium.

Calcium is present in ground water at a maximum concentration of 369 mg/L. Ingestion of two liters of ground water from the Site would result in a daily intake of 738 mg. This hypothetical calcium intake is below the RDA of 1,000 mg per day.

Potassium is present in the ground water at a maximum concentration of 107 mg/L. Ingestion of two liters of ground water from the Site would result in a daily intake of 214 mg of potassium. A daily intake of approximately 3,500 mg is needed by the human body. Thus, this hypothetical intake of potassium is well below the daily amount needed by the human body.

Evaluation of Iron and Manganese

With regard to iron and manganese, ground water concentrations at the Site are naturally high due primarily to the following conditions (Lewis et al., 1991):

- Presence of extensive swamp habitats with naturally high iron and manganese concentrations;
- Naturally high iron and manganese in the Upper PRM and Upper Middle PRM aquifers;
- Subsurface peat layers high in iron and manganese; and
- Low dissolved oxygen concentrations in ground water.

The USEPA Maximum Contaminant Levels (MCLs) and the New Jersey Ground Water Quality Standards for iron and manganese are based upon secondary water quality criteria (taste and odor, staining of fixtures), and are lower than health-based screening values (N.J.A.C. 7:9-6) for iron and manganese. Concentrations at the Site as well as background concentrations of iron and manganese in the area exceed the secondary standards (Lewis et al., 1991). Also the water quality standards for iron and manganese are orders of magnitude higher than health-based standards for other widespread BROS COPCs that occur at similar concentrations in ground water. These other widespread COPCs will drive stringent ground water remedial actions. In addition, pretreatment to remove these metals would be necessary for potable use of ground water (N.J.A.C. 7:9-6). Iron and manganese removal systems have been observed

throughout the perimeter of the Site during the potable well sampling. Accordingly, iron and manganese in ground water are not evaluated quantitatively in the HHRA but are discussed in the uncertainty analysis discussion. Iron and manganese present in soil are quantitatively evaluated in the draft HHRA (e.g., see Trespasser, surface soil ingestion and dermal contact in AOC-1, Annex Table B-1).

Frequency of Detection Screening

The frequency of detection for a given chemical in a given medium-specific AOC is the number of samples with measurable concentrations of the chemical compared to the total number of samples analyzed in the AOC. For all chemicals, the frequency of detection is reported as a number (e.g., 2 detections out of 4 total samples). In accordance with RAGS (USEPA, 1989; Section 5.9.3, p. 5-22) and the approved Work Plan (Roux, 1999a), frequency of detection screening was applied to address compounds that were detected infrequently. The frequency of detection for each medium in each AOC can be found in Tables 2-1 and 2-2. RAGS Part A (USEPA 1989) recommends a process by which chemicals may be screened from the quantitative risk assessment if they are:

- Detected infrequently in one or two environmental media;
- Not detected at high concentrations; and
- There is no technical basis to conclude the chemical may be present in the media.

As described in the Work Plan (Roux, 1999a) the example of a 5 percent frequency of detection limit given in RAGS Part A was used as point of departure for not including chemicals in the risk assessment.

Within each medium in each AOC, a series of MS-Access® queries were used to address the number of non-detect (ND) qualifiers (e.g. "U" or "UJ"). Rejected data (those data that have "R" as a validated qualifier) were removed from evaluation. If the number of ND qualifiers equaled the number of samples, indicating that the chemical was not detected in any samples in that medium-specific AOC, then that chemical was removed from further consideration in the HHRA. If a chemical registered at least one detection in any sample in a given medium-specific AOC, then that chemical was further evaluated as described below.

Consistent with USEPA's comments (pages 6 & 7) to the EPAR (USEPA, 2002a) that focusing the evaluation on an AOC basis "...precludes the use of Site-wide data because the spatial

distribution of the entire Site does not represent the spatial distribution of the smaller defined area of concern", a frequency of detection screening was completed for each medium-specific AOC, but not Site-wide. If the frequency of detection was less than 5 percent in a medium-specific AOC with 20 or more total samples, the compound was excluded from further consideration for that medium-specific AOC (USEPA, 1989).

Treatment of Duplicate Samples

For duplicate (replicate) samples collected on the same day (i.e., sample splits), the reported concentrations were compared in order to present one concentration for a given location on a given day. The following rules were applied to the sample and to the duplicate in order to establish the concentration and qualifier:

- If a chemical was not detected in both the initial sample and the duplicate sample (i.e., both results had "U" qualifiers), then the final sample value was also considered a non-detected concentration. The lower of the two SQLs was selected for use with the "U" qualifier; although this approach is likely to bias low the resultant exposure point concentration, it is predicted that this bias will be insignificant based on the differences between the two detection limits.

- If the chemical was detected in only one of either the initial sample or the duplicate sample (i.e., one result has a "U" qualifier and the other result was a "POS"), then the final sample value was considered to be the detected concentration. This concentration was selected for inclusion in the data analysis with no associated qualifier; although this approach may bias low the resultant exposure point concentration, it is predicted that this bias will be insignificant based on the differences between the two reported concentrations.

If both the initial sample and the duplicate sample were "POS" (indicating both were confirmed detections), then the final sample value was considered a detected concentration. The arithmetic mean of the initial sample concentration and the duplicate sample concentration was reported without a qualifier to indicate a confirmed detection.

2.2 CHEMICALS OF POTENTIAL CONCERN FOR EACH AOC

Consistent with USEPA (2001a) RAGS (Part D), chemicals of potential concern (COPCs) for each AOC were determined by comparing the maximum detected media-specific concentration

to the applicable screening criterion (described in detail below) following the frequency of detection analysis (Tables 2-3 through 2-24). If either the maximum detected concentration of a chemical in a given medium in a given AOC exceeded its respective screening criterion or if no pertinent screening criterion existed, then that chemical was retained as a COPC (Tables 2-25 through 2-29 summarize the COPCs for each AOC). Exceptions to this approach were for the Johnson and Ettinger vapor intrusion modeling analysis, where only the 5% frequency rule was applied, or if it was detected at least once in an AOC where less than 20 samples were evaluated. This was done since there are no suitable screening values for vapor concentrations (see Section 3.5.1 for further discussion). Secondly, Group A carcinogens were not screened out for either frequency or concentration.

2.2.1 Soil/Sediment Screening Values

USEPA Region III Risk Based Concentrations (RBCs) (USEPA, 2003) and Region IX's Preliminary Remediation Goals (PRGs) (USEPA, 2002b) were used, in part, as justification for whether or not BROS-related constituents in soil and sediment would be retained in the analysis for further evaluation. A discussion of the USEPA Region III and IX media screening criteria is presented below.

USEPA Region III RBCs/Region IX PRGs

As described in the Work Plan (Roux, 1999a), a risk-based screening methodology was used for determining chemicals of potential concern since this approach evaluates the total risk associated with the presence of a chemical in a given medium (USEPA, 1993, 2001d). In the case of the Region III RBCs, a table containing concentrations of over 600 chemicals in several media (including soil), corresponding to a hazard quotient of 1 or an incremental lifetime cancer risk of 1E-6 (also expressed as 1×10^{-6} or 1 in a million) is presented (USEPA, 2003). These risk-based concentrations (RBCs) suggested by the USEPA were developed using protective default exposure scenarios for both residential and industrial land uses for soil. The best available toxicity factors (reference doses [RfDs] and cancer slope factors [CSFs]) are incorporated into the calculated RBC. The media concentrations presented in the risk-based table are sufficiently conservative and health protective such that the USEPA would typically not address further in terms of risk to human health concentrations at or below the default values (USEPA, 1993).

Region IX PRGs are a second set of risk-based screening criteria, developed by USEPA Region IX (2002b) for residential or industrial settings. They were used in a complementary fashion along with the Region III RBCs to screen out chemicals whose maximum concentrations were below either or both the Region III RBCs and Region IX PRGs.

Both Industrial and residential direct contact soil PRGs and RBCs were used in screening each AOC where exposure to soils by multiple types of receptors was expected, thus creating a more exact list of COPCs for each receptor. For instance, Industrial PRGs and RBCs were used to screen chemicals for the construction worker, utility worker and groundskeeper, while residential PRGs and RBCs were used for trespassers, residents and restricted recreational users.

Guidance from USEPA (2001d, Introductory Section) suggests that when multiple chemicals are present in a medium, a hazard quotient of 0.1 should be used to ensure that chemicals with additive effects are not prematurely eliminated from the risk assessment. Thus, as discussed in the Work Plan (Roux, 1999a), the RBC concentration for each individual non-carcinogenic chemical was equivalent to an HQ of 0.1 in the screening process. This is a highly conservative approach, since it is based on the potential presence of more than ten non-carcinogenic chemicals each having the same target organ for their toxic action. Additional conservatism results from the use of the maximum concentration in the screening process.

Tables 2-25, 2-27 and 2-29 present a summary of the soil and sediment screening analysis.

2.2.2 Ground Water and Surface Water Screening Values

Consistent with USEPA's (2002a) comments on the EPAR (Roux, 2002), Site ground water data were screened against the lower of Region III and Region IX risk-based residential tap water intake criteria (adjusting the chemical-specific non-cancer hazard index to 0.1). In the instances where a chemical lacked either or both Region III and Region IX tap water RBCs, the data were screened against the lower of Federal MCLs and New Jersey ground water quality standards, which are presented as "Applicable or Relevant and Appropriate" (ARAR) and "To Be Considered" (TBC) screening criteria. Tables 2-26 and 2-29 show the ground water screening results.

For surface water, chemicals were screened against available Federal Ambient Water Quality Criteria (USEPA, 2002c) and New Jersey surface water criteria (NJDEP, 2002). Tables 2-28 and 2-29 present the results of the surface water screening analysis.

2.3 DETERMINATION OF EXPOSURE POINT CHEMICAL CONCENTRATIONS FOR EACH COPC

Following the determination of the COPCs, the final step is to determine the reasonable and realistic exposure point concentrations (EPCs) for use in the intake equations associated with the exposure assessment. The EPC is expressed in units of mass of the chemical per unit mass (or volume) of the exposure medium (e.g., mg chemical/kilogram $_{soil}$).

Based on comments from USEPA (2002a) on the EPAR, this analysis presents EPCs that rely upon 95th percent upper confidence limit (UCL) of the arithmetic mean for normally distributed data. The 95th percent UCL of the arithmetic mean of the log-transformed data is used for log-normally distributed data, or for data that fit neither a normal nor a log-normal distribution. In cases where this calculated value exceeds the maximum sample concentration for a given medium, the maximum detected concentration is utilized as the representative EPC. USEPA's ProUCL software was used to test the distribution for those data where the UCL did not exceed the maximum detected concentration.

AOC- and media-specific EPCs are presented in Tables 2-30 and 2-31 for soils, sediments, surface water and ground water.

3.0 EXPOSURE ASSESSMENT

Exposure assessment is the process of measuring or estimating the intensity, frequency and duration of exposure to an agent present in the environment (USEPA, 1989). In this section, the potentially exposed populations that may have some contact with the BROS Site are defined and the exposure scenarios that are likely to occur in each AOC are described. The exposure pathways derived from soil, sediment, surface water and ground water associated with each current and potential future use scenario are presented and the specific exposure parameters and assumptions selected to derive the exposure estimates are outlined and discussed.

It must be recognized that for on BROS Property and areas on adjacent properties, the influences of the widespread occurrence of free and residual LNAPL (and associated chemical

constituents) on exposure estimates is substantial. The concentrations and estimated exposures associated with soils and shallow ground water are low, except where free or residual LNAPL is present (See Chapters 4 and 5).

3.1 CHARACTERIZATION OF EXPOSURE SETTING

The BROS Property is defined by the metes and bounds survey of the property and covers 29.18 acres (Figure 1-1). Both the BROS Property (on-property area) and the surrounding off-property areas (Figure 1-2) are relatively level topographically. The BROS -Property itself is generally covered with topsoil and grass, except along the northern boundary, which is the location of a gravel driveway and parking area, and where some structures are located. The property is fenced, precluding regular access except by authorized personnel. Figure 1-2 shows an aerial view of the BROS Site as well as the surrounding land, surface water, and wetland features.

The BROS Property is not currently used for any commercial purpose. The single remaining permanent building, the Pepper Building (Photo 1-1 and 1-2), is vacant, and due to lack of maintenance over the years, is in a state of disrepair. There are two trailers located in the northern portion of the BROS Property, which are occasionally used by individuals who are involved in remedial investigation activities at the Site.

Current uses of the off-property areas are varied (Refer to Figure 1-2). To the immediate west of the Property, there is an area that is currently used for agricultural purposes (previously, to grow peaches, and most recently, to grow corn). North and immediately adjacent to the Property lies U.S. Route 130, and further north is Cedar Swamp. Little Timber Creek Swamp is situated to the east and south of the property are two ponds, Swindell and Gaventa Pond, None of these waterbodies have a specified use designation from the State of New Jersey at this time. These ponds were originally created as quarry pits for the construction of I-295 south of the property and filled with water as the road material was removed. Finally, further south and east of the BROS Property are some low-density residential areas and farms.

Future uses of the Property itself (outside of the former lagoon area) will be limited to commercial and/or industrial usage due to the earlier mentioned institutional controls (Section 1.1) as an industrial operation. Access to those areas will no longer be restricted but digging at the Property will not be permitted without approval from USEPA and NJDEP.

Sections of the off-Property areas to the west and south, including Gaventa Pond, may be assigned to the Green Acres Program for future recreational use. The area to the south of the BROS Property, including Swindell Pond, has already been transferred to the Green Acres Program. Thus, the recreational user will enjoy free access to these areas when opened to the public following remediation work. Because of the extremely wet nature (winter and spring) of the swamps located to the east and north and the applicable regulatory restrictions, these areas will never be developed in the future. Similarly, it is expected that current residential and agricultural areas located south of the BROS Property will continue to be used for these purposes in the future. Each of these areas is discussed in greater detail below under its respective geographical (AOC) exposure analysis discussion.

3.2 IDENTIFICATION OF POTENTIAL EXPOSURE SCENARIOS AND PATHWAYS

A preliminary analysis of potential current and future receptors and exposure pathways was presented in the EPAR (2002). This section builds upon that early identification effort and updates, where necessary, receptors and pathways that may have changed since their initial presentation in the EPAR.

General Receptor Overview

The BROS Property has a maintained perimeter fence, limiting access to the majority of the property except to authorized personnel and potential trespassers who would violate access restrictions. While there is a building on the property (Pepper Building), it is vacant and, due to lack of maintenance, is not currently useable. Thus the only individuals that may have potential for exposure on the BROS Property under current conditions include trespassers that may occasionally gain unauthorized access to the property. Authorized personnel who enter the property for the purposes of Site-monitoring and/or remedial investigation work will be subject to the provisions of the Health and Safety Plan for the site (Roux, 1999b), which prescribes the use of personal protection equipment to ensure that no exposure will occur.

The surface soils (approximately the upper two feet) over the former lagoon are clean cap material and disturbance of the subsurface soils is prohibited by deed restriction without approval by USEPA and NJDEP (Roux, 2003a), consistent with the Phase 1 remedy. It is possible, however, that certain limited activities could occur now or in the future in the areas of the property that surround the filled and cap-covered area.

Tables 3-1a through 3-1i present an analysis of plausible potential on- and off-Property human exposures to BROS-related COPC based on the most current information on the Site and surrounding environs. The following discussion summarizes potential current and foreseeable future exposures within each key AOC on and off the BROS Property.

- Trespassing teenagers (on-Property surface soil exposure)
- Groundskeepers (on-Property surface soil)
- Construction workers (surface and subsurface soil and shallow ground water)
- Utility workers (surface and subsurface soil)
- Adult and child residents (off-Property shallow and deep ground water potable use)
- Adult and child agricultural (off-Property shallow and deep ground water spray irrigation)
- Adult and child recreators (surface water and sediments in CS and LTCS)

BROS Property and Adjacent Upland Properties

There are two exposure scenarios for upland areas that are most realistically, but still conservatively, evaluated across the entire area containing BROS-related chemicals in soil, LNAPL and associated shallow ground water: (1) receptors using the area for a future restricted recreational use; and (2) the potential use of shallow ground water along the perimeter of the BROS Property, on other properties (GW AOC1).

Upon completion of intrusive and surface altering actions, a passive recreation use such as upland wildlife habitat and viewing would likely be compatible with the final remedy. Restricted recreational use would prohibit subsurface disturbance (below the top few inches of surface) and involve potential exposure scenarios of relative frequency and duration. In addition, potential recreational users would use a large portion of the property rather than be limited to a particular area. Consequently, the potential recreational exposure was evaluated for the entire BROS property and not by Hot Spots or AOCs.

Exceedances of NJ GWQS in shallow ground water is limited to the areas with free or residual LNAPL and close proximity (within approximately 50 feet). Since the early 1980s, the distribution of site-related chemicals has shrunk substantially (Chapter 5). Only where the ground water is in contact with the lagoon, buried drums, and process area residuals are NJ GWQS exceeded for BROS-related organic COPCs. Consequently, the use of the shallow

ground water will be prohibited until the remaining source materials are remediated or an ARAR-waiver is adopted. Municipal water supply is available for the BROS property and adjacent properties. Quantitative assessment of chemicals in ground water is included in the evaluation of the upland Hot Spots and AOCs.

Soil AOC BROS Property (BP AOC) and Shallow Ground water AOC 1A (Excluding Hot Spots 1 & 2 and Debris Fill Area)

The BROS Property is a 29-acre tract of land that is entirely enclosed by a fence (Figure 1-4). The portion of the property not included in other AOCs is approximately 14 acres. Solid waste regulations and deed restrictions on the property limit potential exposures and preclude the use of the ground water beneath the property. No assessment of risks associated with 13 acres of landfilled incinerator ash was completed because the USEPA assumes the applicable regulations and deed restrictions will preclude disturbance of the ash.

Table 3-1a presents an analysis of potential current and foreseeable future human exposures to BROS-related COPC in soil AOC BROS Property (BP) and ground water AOC 1A (Figures 1-4 and 1-5, respectively).

Current Use

Under current conditions, individuals could occasionally gain access past the fence and enter the BP AOC without permission. These trespassers, who would most likely be adolescents between the ages of 10 and 17 years, have some potential for direct contact with surface soil outside of the cap area.

Because some of the COPCs found in subsurface soils and ground water on the BP AOC are volatile and semi-volatile, it is possible that there may be some vapor flux into the ambient air. However, air monitoring conducted during remedial work on the lagoon did not indicate that levels of volatile materials in ambient air were elevated above background levels during that work (Roux, 2003a). Thus, it is concluded that the inhalation of vapors in ambient air at the Site is an incomplete exposure pathway for all individuals who may spend time there, following the removal of the former lagoon. Also, because there is little likelihood that trespassers will disturb the soil below the top inch or two, there is no potential for them to come into contact with subsurface soil or ground water, which is 2 to 6 feet below the surface. It is assumed for this risk assessment that a trespasser at the Site may have incidental ingestion of surface soil,

dermal contact with surface soil, and inhalation of particulates originating from the surface soil outside of the cap area.

There may also be times when adults enter the Site for the purpose of Site maintenance (e.g., mowing of grass, pruning shrubbery, etc.). During this activity, these individuals might be exposed to COPCs in surface soil outside of the cap area. To consider this potential type of exposure, a groundskeeper scenario is evaluated as part of the current use risk assessment. It is assumed that, like the trespasser, this individual may have incidental ingestion of and dermal contact with surface soils and may inhale particulates derived from surface soils.

Adult construction workers may be exposed to surface soil, subsurface soil and ground water during excavation and construction of building foundations. Therefore, there may be direct contact exposures to surface soils and inhalation of particulate dust derived from surface soils during the remaining period of construction at the Site under current use conditions. In addition, once buildings under construction are enclosed, there may be some potential for inhalation of vapors, originating from ground water and subsurface soils under the enclosed building, during the workday. Thus, for construction workers, dermal contact and ingestion of surface and subsurface soil, dermal contact with ground water, and inhalation of vapor are evaluated.

Similarly, adult Utility Workers may be engaged in short-term excavation activities during installation or maintenance of utilities at the Site. Thus there may be potential for dermal contact and incidental ingestion of subsurface and surface soil during these activities. Finally, while the depth to shallow ground water Site-wide is on average approximately 6 feet, utilities would not be situated in the saturated zone and, for this reason, routine utility worker contact with shallow ground water will not be evaluated further in this analysis

Finally, authorized adult personnel may enter the Site for the purposes of Site monitoring and remedial investigation work. During these activities, individuals may have contact with surface soil, subsurface soil, and ground water at the Site. However, any individuals engaged in this activity will be subject to the provisions of the Health and Safety Plan for the Site (Roux, 1999b), which prescribes the use of personal protection equipment to ensure that no exposure will occur. Thus these individuals are assumed to have no exposure and will not be evaluated further in this analysis.

Future Use

The future use of the BROS Property has not been fully defined. Long-term (40+ years) commercial/industrial land use is likely to continue, and the deed restrictions currently in place will carry forward with the land in perpetuity ensuring that the BROS Property will not be used for residential purposes. Upon completion of intrusive and surface altering actions, a passive recreation use such as upland wildlife habitat and viewing would likely be compatible with the final remedy.

Restricted recreational use would prohibit subsurface disturbances (below top few inches of surface) and involve potential exposure scenarios of relatively low frequency and duration. In addition, potential recreational users would use a large portion of the property rather than be limited to a particular area. Consequently, this exposure was evaluated for the entire BROS Property and not by Hot Spots or AOCs. If redevelopment of the Property were to occur, such as the placement of new structures for commercial/industrial uses in areas outside the boundary of the former lagoon, exposure to workers would likely occur. Such future development activities would, in addition to building construction activities, require the installation and maintenance of utilities. Moreover, once development is complete (if any), adults may spend their workweek engaged in indoor activities, and groundskeepers may be hired to maintain the exterior of the property. Should this future development occur, the potentially exposed receptor groups on the BROS Property include construction workers, utility workers, indoor commercial/industrial workers, and groundskeepers involved in the outdoor maintenance of the property (Table 3-1a).

Hot Spot 1 (Soil AOC 1, GW AOC 1A) on the BROS Property

Soil Hot Spot 1 occupies an area in the northeastern corner of the incinerator ash landfill[5] and the former process area (Figure 1-4). The area is defined by substantially elevated VOCs (chlorinated solvents and BTEX) and LNAPL containing high PCB concentrations. Potential current and foreseeable future exposures to COPC in Hot Spot 1/GW AOC 1A are comparable to those identified above for the BROS Property. Table 3-1b presents a summary of potential current and future exposures that could occur in this area.

[5] The former Lagoon Area on the BROS Property was backfilled with lime stabilized ash generated from on-Site incineration activities (approximately 13.2 acres). Based upon post-treatment testing of the ash conducted by the Army Corps of Engineers, this ash contains lead and other chemical constituents at concentrations in excess of screening criteria used for the HHRA. Disturbance of this ash layer is prohibited by deed restriction and applicable New Jersey Solid Waste laws.

Current Use

Under current conditions, a groundskeeper and adolescent trespasser could be exposed to COPC in surface soil (0 to 2 inches deep) in areas not covered by the 2-foot clean fill cover over the majority of Hot Spot 1. Exposure could conceivably occur via incidental ingestion of surficial soil (from eroded capped areas), dermal contact, and inhalation of surface-derived dust. Construction/Utility workers that might conduct building or repair activities in this location could be exposed to COPC in subsurface soil below the clean fill cap. Routes of exposure might include incidental ingestion, dermal contact, inhalation of sub-surface-derived dust, and dermal contact with shallow ground water[6] (Table 3-1b).

Future Use

Potential future receptor exposures in Soil AOC 1/GW AOC 1A are likely to be similar to current potential exposures with the exception that a building could be erected on this location, and future indoor commercial/industrial workers could be exposed to vapors intruding from contaminated subsurface soil, ground water, and LNAPL. All other receptor exposures, consistent with current potential exposure groups for this soil/ground water AOC, are also possible (Refer to Table 3-1b).

Hot Spot 2 (Soil AOC 6, GW AOC 1A) on the BROS Property

Soil Hot Spot 2 (Soil AOC 6) located in the northwestern portion of the BROS Property near the Pepper Building (Figure 1-4) has distinctly elevated VOC concentrations, especially benzene, and LNAPL containing elevated PCB concentrations. Table 3-1c presents an analysis of potential current and foreseeable future exposures in this soil and ground water location. Human receptors and associated exposure pathways for this soil/ground water AOC are that the same as those presented above for Hot Spot 1.

Current Use

Possible receptors include a groundskeeper and trespasser exposed to COPC in surface soil that resides outside the clean fill cover over the ash landfill. Potential routes of exposure include incidental ingestion, dermal contact, and inhalation of dust derived from surface soil (Table 3-1c). Construction/Utility workers could also be exposed to COPC in this location at a depth at or above the water table. Exposure routes include incidental ingestion, dermal contact,

[6] Utilities would not be placed in saturated soil. Therefore, only the construction worker is evaluated for risks related to dermal contact with shallow ground water.

and inhalation of dust derived from subsurface soil and dermal contact with shallow aquifer ground water for the construction worker.

Future Use

Potential future receptor exposures in Soil AOC 6/GW AOC 1A are likely to be similar to current potential exposures for this AOC with the exceptions that a building could be erected on this location, and future indoor commercial/industrial workers could be exposed to vapors intruding from contaminated subsurface soil, ground water, and LNAPL. All other receptor exposures are possible, consistent with current potential exposure groups for this soil/ground water AOC (Refer to Table 3-1c).

Drainage Swale Adjacent to the BROS Property (Soil AOC 2, GW AOC 1D)

The Drainage Swale AOC is approximately 0.1 acre in size, adjacent to the BROS Property and along US Route 130 where petroleum product is present at the water table (Figure 1-4) and surface soils have no detectable BROS-related COPCs. Public access to this area is limited but subsurface digging for utilities or road repairs is not restricted.

Current Use

Due to the unrestricted nature of Soil AOC 2, construction and utility workers may be exposed to BROS-related COPCs in subsurface soil during utility repairs or road construction and maintenance activities (Table 3-1g). Contact with shallow ground water is not a reasonable exposure pathway, as the average depth to AOC 1D shallow ground water is approximately 8 to 9' bgs.

Future Use

The future use and associated human exposures to Soil AOC 2/ GW AOC 1D is not predicted to differ from its current potential use because of the steep embankment along Route 130 and its overlap with the highway right-of-way. Accordingly, construction and utility workers may be exposed to BROS-related COPC in subsurface soil during utility repairs or road construction and maintenance activities (Table 3-1g). No ground water-related exposures are likely, due to the average depth to shallow ground water of 8 to 9' BGS and placement of a water supply well in this area would not be approved under current NJDEP well regulations.

Debris/Fill Area (Soil AOC 3, GW AOC 1A) on the BROS Property

The Debris/Fill Area (Soil Hot Spot 3) is located in the southwestern corner of the BROS Property, adjacent to Little Timber Creek Swamp (LTCS-II) and Swindell Pond (See also Figure 1-2). This area was an area with small lagoon structures during BROS operations and contained buried drums, removed by USEPA in 2002. Table 3-1d presents a summary of potential current and foreseeable future exposures in this soil and ground water location. Human receptors and associated exposure pathways for this soil/ground water AOC are similar to that presented above for Hot Spot 2.

Current Use

Possible receptors include a groundskeeper and trespasser exposed to COPC in surface soil that resides outside the clean fill cover over the ash landfill. Potential routes of exposure include incidental ingestion, dermal contact, and inhalation of dust derived from surface soil (Table 3-1d). Construction/Utility workers could also be exposed to COPC in this location at a depth at or above the water table. Exposure routes include incidental ingestion, dermal contact, and inhalation of dust derived from subsurface soil and dermal contact with shallow aquifer ground water for the construction worker.

Future Use

Potential future receptor exposures in the Debris/Fill Area are likely to be similar to current potential exposures for this AOC with the exception that a building could be erected on this location, and future indoor commercial/industrial workers could be exposed to vapors intruding from contaminated subsurface soil, ground water, and LNAPL. All other receptor exposures are possible, consistent with current potential exposure groups for this soil/ground water AOC (Refer to Table 3-1d).

South Side of Property (Soil AOC 4, GW AOC 1C)

The South Side property was formerly private property that has been transferred to the Green Acres Program as a future recreational use property, pending removal of the residual LNAPL adjacent to the BROS Property and completion of ground water remediation that requires extensive access to the property. It is located adjacent to, and south of, the BROS Property. Over half of the property is taken up by Swindell Pond, a former sand quarry pit. Access to the property is limited due to its location adjacent to Route I-295, the BROS Property and Little Timber Creek Swamp (Figures 1-4 and 1-2). The property was historically used for the sand and gravel mining operations that took place during the 1950s and 1960s. Since that time, the

property has been used for limited storage of construction equipment and the pond is used intermittently for fishing and recreation by trespassers. There is no current use of the ground water at this property and construction of a potable well on the property is prohibited by deed restrictions.

Residual petroleum product and BROS-related COPCs have been detected in soils (approximately 0.23 acres) near the water table (Soil AOC 4) and in shallow ground water (Ground water AOC 1C) near the BROS Property (Figures 1-4 and 1-5). As discussed later in this document, BROS-related COPCs are also present at the base of the UMPRM aquifer (110 to 113 feet below ground surface) (Ground water AOCs 3 and 4) at the South Side Property (Figure 1-3). Sampling of Swindell Pond during the Phase 2 RI documented the absence of BROS-related chemicals (Roux, 2003a) in surface water and sediment.

Table 3-1f describes potential current and foreseeable future receptor exposures to COPC in Soil AOC 4 and Ground water AOC 1C.

Current Use

Currently, the area defined by the extent of Soil AOC 4 and Ground water AOC 1C is a small portion of the property which includes Swindell Pond and adjacent lands, under the ownership of the Green Acres Program.

Future Use

In the future, construction work remains possible, in preparation for eventual routine recreational use of this property, small-scale construction may be required to add amenities such as benches, small shelters and, perhaps, a small educational building. In addition, habitat enhancements of Swindell Pond may be included in the wetland mitigation work. Consequently, construction workers may be exposed to BROS-related COPC in subsurface soil in Soil AOC 4, if it remains in place at the time of work. Similarly, since the depth to shallow ground water is 2 to 4 feet deep in this area, construction workers could inadvertently be exposed to COPC in shallow ground water via dermal contact (Table 3-1f). In the unlikely event that a ground water well extracting shallow ground water from GW AOC 1C were developed to supply drinking water to a fountain, adult and child recreators might be exposed to COPC from the shallow aquifer. Accordingly, this HHRA estimates the hypothetical risk associated with low-frequency consumption of shallow ground water (Table 3-1f).

West Side of Property (Soil AOC 5, Shallow GW AOC 1B)

The West Side Property AOC (Soil AOC 5) is a small portion of the private property adjacent to the BROS Property that is currently used as a farm field. AOC 5 is approximately 1.0 acre is size. Free and residual LNAPL extend beyond the BROS Property beneath the West Side Property AOC along the water table, 6 to 10 feet BGS (Roux, 2003a). This AOC is defined by the presence of LNAPL, since LNAPL seeped from the former BROS lagoon and is the source of COPCs in soil on the West Side Property. LNAPL (TPH) and BROS-specific petroleum hydrocarbons (principally BTEX and PAHs) were detected in the immediate vicinity of the water table (LNAPL smear zone) in soil samples collected in Soil AOC 5, but were not detected in shallower or deeper samples (Roux, 2003a).

Table 3-1e describes potential current and foreseeable future receptor exposures to COPC in Soil AOC 5 and Ground water AOC 1B.

Current Use

Because the depth to BROS-related COPCs in this area is 6 to 10 feet BGS (Roux, 2003a), there is no direct contact with BROS constituents under present use conditions. As noted above, the property on which AOC 5 is located (Gaventa Farm), has been used in past years to grow peaches. Peach samples were collected in July 2001 from peach trees that have since been removed and replaced in 2003 with a sweet corn crop (described in more detail below). The peach sampling was conducted as a screening level evaluation to determine if there was any need to conduct a more detailed analysis within the former orchard field to determine if any risk management measures were appropriate (Roux, 2001). Samples of peaches were collected from the area where orchard trees overlay the chemical residuals (LNAPL and BROS-related COPCs) and from a distant portion of the orchard to assess background conditions. The results of the screening level assessment were summarized and provided to the USEPA (July 31, 2001 letter from P. Brussock [ELM] to R. Naman [USEPA]). Only one chemical, bis(2-ethylhexyl)phthalate, was detected, and that in only one of 18 samples. The reported concentration of bis(2-ethylhexyl)phthalate was 1.9 mg/kg. The low frequency of detection (1/18), coupled with the fact that this compound was not detected significantly higher than in the background area, indicates that this compound does not present a potential human exposure issue. On July 31, 2001, the USEPA concurred with the BROS Technical Committee's recommendation that no further action was necessary with regard to the peaches at the West Side Property.

Early in 2003, the peach trees were removed due to their age and declining productivity and the land was used to grow sweet corn. This same field maybe used to grow a variety of crops for several years. Wine grapes are likely to be planted in the front portion of the property in 2004 and corn in the back portion of the property where the LNAPL residuals occur. For a number of reasons, corn also would not be predicted to accumulate BROS-related COPC, especially in light of the lack of chemical uptake in the former peach trees.

First, sweet corn root development for a mature plant tends to concentrate root mass in the top few feet of soil, with only the deepest tap root potentially reaching depths of 50 inches if water is in short supply in the near surface, and only occasionally to a depth of 68 inches (Weaver and Bruner, 1927). Thus, it is unlikely that corn grown in soil AOC 5 would likely reach BROS-related contamination that begins at its shallowest point at 6 feet BGS with other areas beginning at 10 feet BGS.

Second, the chemical constituents reported to be present in LNAPL (TPH, BTEX and PAHs) are compounds that, generally speaking, do not bioaccumulate in the fruit or vegetable itself. Some plants are able to break down hydrocarbons and metabolize them into various acids and CO_2 (Frick et al., 1999). Durmishidze (1977, cited in Frick et al., 1999) reported that benzene, toluene, and xylene were metabolized by cereal grasses in only two to three days; phenol was the primary conversion product of benzene in plant tissue, with subsequent production of various acids (Durmishidze, 1977, cited in Frick et al., 1999). The primary breakdown product of toluene was glycol, as well as glyoxalic, fumaric, succinic, and malic acid (Durmishidze, 1977, cited in Frick et al., 1999). Finally, benzo(a)pyrene was reported to be metabolized by 14-day-old corn and bean plants, alfalfa, ryegrass, chick pea, cucumbers, squash, orchard grass, and vetch (Durmishidze, 1977; Edwards, 1988, cited in Frick et al., 1999). This research suggests that, even if BROS-related COPC on the West Side of the property came in contact with a corn crop, these compounds would not likely be sequestered in the plant or translocate to the corn ear.

Third, the peach analytical results summarized above did not indicate that BROS-related COPCs were potentially a problem. Because peach trees that were sampled were over 15 years old at the time of sampling, they would likely represent a reasonable maximum-case scenario (over a seasonal crop such as corn) for the possible uptake of Site COPCs. The absence of COPCs in peach fruit indicates that the growing zone in this area remains unimpacted by BROS constituents.

Although designated by the State as a potable supply aquifer, shallow ground water in this AOC is not currently used for any purpose. A limited amount of contaminated sediment was discovered along the edge of Gaventa Pond (See Figure 1-4). However, the steep slope along the edge of the pond and the limited area above the pond surface precludes any significant direct contact with these sediments. Moreover, all residual LNAPL will be removed from the surface soils along with the elevated concentrations of COCs, such as lead and PCBs, based on ecological risk reduction measures (AMEC, 2003) and on removal measures stipulated in the 1984 Site ROD[7].

Future Use

In the future, construction activities could occur on the West Side Property. However, the significant depth (6' to 10' below ground surface) at which COPCs have been identified at the soil/ground water interface suggests that even construction work activities are unlikely. Moreover, continuing remedial action for LNAPL is expected consistent with NJAC 7:26E-6.1. Future potential construction worker exposure evaluations will deal only with exposures to post LNAPL-remediation residuals.

Adults and children residing in a hypothetical dwelling located on Soil AOC 5 could be exposed to COPC vapors emanating from impacted soil, ground water and LNAPL. Accordingly, the indoor vapor inhalation exposure pathway will be quantified in this HHRA (Table 3-1e). Similarly, shallow ground water can be used for domestic residential purposes (drinking, bathing) where individuals can be exposed to COPC via inhalation of volatile compounds, ingestion (of drinking water), and dermal contact while bathing. Finally, should shallow ground water be used for crop irrigation, residents living on the irrigated premises could be exposed to shallow ground water-related COPC via inhalation of volatile compounds and, in the case of children who might use irrigation spray to cool themselves in the summer, may also be exposed via direct dermal contact.

Deep Ground Water (below 40' of Ground Surface) AOCs

The Deep Ground Water beneath the BROS Property begins below the confining layer between the Upper PRM/Recent Deposits and the Upper Middle PRM. BROS COPCs are limited to the aqueous phase below the confining layer, whereas, above the confining layer is a

[7] Sediment removal and its associated risk reduction measures would apply to current and future uses of this area within AOC 5.

heterogeneous mix of lagoon residuals, drum residuals, free and residual LNAPL (above and trapped below the water table at various depths), and aqueous phase COPCs associated with the remaining source materials (Figure 1-3).

Three distinct deep ground water areas, GW AOC 2, 3, & 4, exist beneath and downgradient of the BROS Property. They are shown in cross-section view on Figure 1-3. The summary that follows presents key issues associated with current conditions each of these deep ground water AOCs.

Current Use

Ground water AOC 2 (GW AOC 2) represents the Upper Middle PRM (UMPRM) aquifer excluding the bottom 15 feet of the aquifer beneath the BROS Property (Figure 1-3). GW AOC 2 is distinguished from the overlying GW AOC 1 and the underlying GW AOC 3 based on substantially lower concentrations of chemicals, fewer chemicals, and differing physical/chemical conditions (pH, TDS, sulfate, etc.). Deep ground water is not used for water supply or irrigation on or adjacent to the BROS Property. Public water supply is available along Cedar Swamp Road. In addition, use of ground water at the BROS Property is precluded New Jersey Solid Waste regulations regarding the placement of incinerator ash as part of the Phase 1 remedy and by a deed restriction.

Ground water AOC 3 (GW AOC 3) represents the base of the Upper Middle PRM aquifer beneath and immediately downgradient of the BROS Property (limited upland portion of the South Side property north of Swindell Pond) (Figure 1-3). Use of this portion of the aquifer under the BROS Property is precluded by New Jersey Solid Waste regulations and deed restriction. The mass of dissolved chemicals in ground water is substantially more concentrated in GW AOC 3 than the overlying GW AOC 2. Relatively high dissolved chlorinated solvents, petroleum mono-aromatic compounds (benzene, toluene, ethylbenzene, xylenes), sulfates, iron and manganese are detected in this AOC. Total dissolved solids are also high and related to the low pH (less than 3) associated with the past release of waste sulfuric acid that was used in the oil recovery process on the property.

Ground water AOC 4 (GW AOC 4) is defined as the base of the Upper Middle PRM aquifer downgradient from Swindell Pond (Figure 1-3). South of Swindell Pond and Interstate 295, the number of COPCs is substantially less than in the near source areas north of Swindell Pond. Concentrations of these constituents are also significantly lower. The Upper PRM is unaffected

by BROS COPCs and only the lower portion (approximately 15 feet) of the Upper Middle PRM contains COPCs above health-based standards. Land overlying GW AOC 4 consists largely of uses that preclude ground water use by potential human receptors: a pond covers over 13 acres; wetlands and transition areas cover a large area; and Interstate 295 and its associated right-of-way cover the downgradient portion of GW AOC 4. Beyond I-295 to the south, LTCS lies directly over the primary flow path for BROS COPCs in ground water. Only along the perimeter of LTCS is there land that may require ground water supply for agricultural or residential uses, although none currently exist.

Future Use

GW AOC 2: This ground water unit is in close proximity to the BROS Property and especially the landfilled ash material. Use of ground water at the BROS Property, and indeed within a 150-foot perimeter of the landfill contents per New Jersey Solid Waste regulations, is prohibited. Thus, this ground water AOC does not represent a reasonable exposure point of potential human contact. USEPA itself acknowledges this point in RAGS (USEPA, 1989): "In a few situations, however, it may not be reasonable to assume that water will be drawn from directly beneath a specific source (e.g., a waste management unit such as a landfill) in the future. In these cases, it should be assumed that water could be drawn from directly adjacent to the source".

GW AOC 3: While many of the same stringent ground water use restrictions articulated for GW AOC 2 also apply to GW AOC 3, due to the Green Acres Program control of a portion of the overlying land, a remote possibility exists that a ground water well may developed for recreational use (ground water consumption) in GW AOC 3 adjacent to Swindell Pond. Consequently, this HHRA will quantify hypothetical risks associated with a child and adult using the property for recreational purposes and ingesting ground water from GW AOC 3 on a low frequency (Table 3-1h).

GW AOC 4: There is the potential for future domestic use of this part of the aquifer (Figure 3-1). However, the Upper PRM is physically separated from the Upper Middle PRM by a confining layer and is unimpacted by the BROS Site overlying GW AOC 4, and can supply ground water if necessary in the future. Also, a municipal water supply is available and, as already discussed, land overlying GW AOC 4 consists almost entirely of uses that preclude ground water use by potential human receptors (pond, wetlands, and Interstate Highway). The planned future use of Swindell Pond property is open space under state or township management. Deed restrictions

prohibiting ground water use have been placed on the property prior to the transfer of the property to the state or township. A ground water Classification Exception Area/Well Restriction Area (CEA/WRA) is in place in the interim. Nonetheless, the risks associated with ground water uses from GW AOC 4 will be quantified in this HHRA on the Swindell Pond property and agricultural land south of I-295. Potential receptors include residents that use AOC 4 ground water for drinking and bathing. Routes of exposure quantified include ingestion of ground water, dermal contact during bathing, and inhalation of vapors while showering. A second set of possible receptors includes adults and children exposed to vapors from hypothetical farm spray irrigation and children's dermal contact exposure during warm summer months when they play under sprinkler spray.

In addition to Deep Ground water AOCs 2, 3, and 4, sentinel wells[8] were established in the water table and Upper Middle PRM aquifers downgradient of source areas. These wells are in areas of the aquifer where chemicals associated with the BROS Site are either not detected or are detected at low concentrations, below established ground water quality criteria for the protection of human health (Roux, 2002). Portions of the study area where BROS-specific COPCs have not been detected in ground water are depicted on Figure 1-5 and 1-3 as the locations of sentinel wells. Data from the sentinel wells are used for comparison to the wells within the AOCs, and represent both upgradient and downgradient conditions. Ground water Classification Exception Area/Well Restriction Areas (CEA/WRA) have been established for portions of the recent alluvium and Upper PRM (Water Table aquifer), and UMPRM where COPC concentrations exceed New Jersey GWQS, and updated CEA/WRA based upon the Phase 2 RI data was approved by NJDEP (Roux, 2003a).

With regard to potential human exposures to COPCs in sentinel wells (Figure 3-1h), Ground water modeling indicates that all sentinel AOCs will remain below drinking water MCLs or other primary drinking water criteria (See Chapter 5 of RI for a detailed discussion of this analysis).

Wetland (Surface Water and Sediment) AOCs

As described below, the following five AOCs were established in the EPAR (Roux, 2002) for the Baseline Human Health Risk Assessment of wetlands areas at the Site. Similar AOCs[9] had

[8] North Deep Sentinel wells include MW-8B, MW-9B, MW-20D, EPA-108, S-8, and S-9; South Deep Sentinel wells include MW-10B, MW-11A(D), MW-14A, MW-14B, MW-15A, MW-15B, MW-16A, MW-16B, MW-171, MW-221, MW-34D, MW-35D, S-5, S-6 and NJDEP-1 (Roux, 2002).

[9] The term "AOC" was not used in the ERA (AMEC, 2003), but instead the swamp areas were given a different designation (e.g., LTCS-II, LTCS-III).

previously been identified as part of the ecological risk assessment (AMEC, 2003). However, human accessibility to the wetland areas are more limited (compared to ecological receptors) due to (1) the presence of dense vegetation, (2) flooded conditions for approximately six months of the year, and (3) relatively high human health preliminary remediation goals (PRGs) compared to the aquatic receptor criteria used in the ecological evaluation. Very limited public use of the swamps (Little Timber Creek Swamp or Cedar Swamp) was observed during the duration of Phase 2 RI/FS field program. However, there is some potential for human receptor contact to wetland edges such as the culvert areas. For clarity, the wetlands AOCs for the human health evaluation are designated with the letter 'H' to denote this distinction (Figure 3-1).

- Little Timber Creek Swamp [LTCS-H1]: LTCS-H1 includes upstream portions of Little Timber Creek Swamp south of Route 295 (Figure 3-1). There are a relatively small number of BROS-related chemicals detected in LTCS-H1 and all were below screening concentrations except for arsenic which is a widespread background contaminant from agricultural runoff throughout southern New Jersey (Fields et al, 1993; Schick, 1999). The maximum detected concentration in sediment was close to the soil screening criterion, within the range of background concentrations, and was collected from the most upstream location studied during the RI. Thus, LTCS-H1 is not considered further in the Human Health Risk Assessment.

- Little Timber Creek Swamp [LTCS-H2]: LTCS-H2 is the portion of Little Timber Creek Swamp immediately adjacent to the Route 130 culvert (Figure 3-1). This area is not used by potential human receptors, except for occasional road or road culvert maintenance.

- Little Timber Creek Swamp [LTCS-H3]: LTCS-H3 is the portion of Little Timber Creek between Route 130 and Route 44 (Figure 3-1). The perimeter of LTCS-H3 may be used occasionally by deer hunters. The highest concentrations of BROS-related chemicals are located in the interior of the densely-vegetated swamp.

- Cedar Swamp [CS-H1A]: CS-H1A is the portion of Cedar Swamp from the tide gate and down the Little Timber Creek channel towards the Delaware River representing an area of 26.6 acres (Figure 3-1). A portion of the Little Timber Creek channel is used occasionally by fishermen. There are relatively few BROS-related chemicals detected above background and sediment screening criteria in this area. A Site-specific bioavailability assessment conducted as part of the ERA (AMEC, 2003) indicates low bioavailability of these chemicals for food chain uptake.

- Cedar Swamp [CS-H1B]: CS-H1B is a portion of Cedar Swamp from the culvert at Route 44 towards the north (away from the tide gate). This area is predominantly wetland transition area that could be used by hunters (Figure 3-1). There are no BROS-related chemicals detected in sediments at concentrations above background and screening criteria in this area.

Based on these area-specific observations, in the wetland areas off-property, especially in areas along roadways where movement is possible, there may be the potential for exposure to

sediment and surface water during recreational activities such as hunting, hiking, bird watching, etc. For purposes of calculating human health risks, these activities have all been grouped into the category of general recreational use of wetland areas (Table 3-1i). In these areas, there is potential for young children, older children, and adults to have dermal contact with bank sediments and incidentally ingest these sediments due to hand-to-mouth (eating, smoking, etc.) activities (Table 3-1i).

Cedar Swamp/Little Timber Creek Channel AOC

In addition to potential sediment and surface water exposures in Little Timber Creek (LTC) and Cedar Swamp (CS), individuals periodically catching and consuming small fish from these systems could be exposed to Site-related COPC. The following discussion describes fish catch and analysis efforts in support of the Site ecological risk assessment (AMEC, 2003).

As specified in a USEPA-approved work plan (Ogden, 2000), extensive fish surveys of available habitat were performed in Little Timber Creek (LTC) in Cedar Swamp near Route 44 and within the LTC channel adjacent to the outlet of Cooper Lake during February and April 2000 (Ogden, 2000; AMEC, 2003). Additional surveys were conducted in Cedar Swamp near the transmission line right-of-way in April and August 2000, and in May and June 2001. Twenty species of fish were collected using Fyke net, minnow traps, minnow seine, electroshock backpack, and eel pots from the surveys performed at LTC over the period February 2000 through June 2001. White perch were most commonly captured, followed by brown bullhead catfish, striped killifish, and pickerel (Table 3-2). The species captured in LTC in Cedar Swamp differs and is less diversified compared with those reported in the main channel of the Delaware River (O'Herron et al., 1994), but this was predicted since the LTC sampling stations are in a tidal backwater tributary to the river.

The vast majority of fish have total lengths ranging from 100 mm to 300 mm (3.9 to 11.8 inches; Table 3-2. However, the more desirable fish from the standpoint of human consumption (e.g., white perch), approximately averaged only 150 mm (approximately 6 inches) in length. The smaller fish present in LTCS and Cedar Swamp are reflective of the tidal backwater habitat. This area is not likely to support fish of larger sizes due to limitations of the physical habitat; very shallow and narrow water (less than 2 feet during low flow), limited dissolved oxygen, limited food sources, and low or non-existent flow during portions of the tidal cycle. Water bodies more proximal to the Delaware River would provide larger and more desirable fish compared to this backwater area near the BROS Property.

However, if it were to be assumed that these fish are consumed by anglers, then it would be important to note that the concentrations of the primary chemicals of concern in the ERA (lead, mercury and PCBs) – which are also COPCs in the HHRA – were comparable to the concentrations reported in the reference area that was not affected by BROS activities Accordingly, a further quantitative evaluation of the fish consumption pathway is not warranted for the BROS Site.

In its comments on the EPAR, USEPA (2002a) challenged the use of FDA's 2 ppm PCB temporary tolerance residue level for fish (cited in 21CFR109.30) as a metric by which to compare fish tissue PCB levels from species collected in Cedar Swamp and Little Timber Creek. USEPA commented that the appropriate comparative level (instead of FDA's 2 ppm value) should have been an USEPA value of 0.05 mg/Kg (ppm). While not explicitly stated, it is assumed that USEPA was referring to its 1999 *Polychlorinated Biphenyls (PCBs) Update: Impact on Fish Advisories* document where a total PCB fish tissue concentration of 0.05 mg/kg (ppm) corresponds to an individual consuming "...three 8-oz. meals per month (based on the non-cancer health endpoint - USEPA's reference dose) or a half of an 8-oz. meal per month (based on the cancer health endpoint - USEPA's cancer slope factor)...". The BROS Committee respectfully disagrees with the applicability of the 0.05 mg/Kg comparative concentration for the following reasons. First, as noted earlier, CS and LTCS are not magnate fisheries - anglers would be far more inclined to seek out more productive fisheries in recreational accessible areas, such as the Delaware River and its tributaries. This statement is supported by hundreds of hours of observations on-Site during the last seven years. Second, the size of fish present in the CS and LTCS systems, also summarized above as a component of the BROS (2003) ERA, would not support fish of adequate sizes to sustain 4 to 24 ounces of fish per month (for a total yearly intake of 48 to 288 ounces of fish [3 to 18 pounds!]). Third, total PCB concentration ranges for white perch fillet samples collected from LTC in Cedar Swamp overlapped substantially with those from the background (reference) study area (ERA, 2003). Subsequent statistical analysis of the natural log *ln*-transformed data – (this was required since the untransformed data were not normally distributed) showed no significant difference ($p = 0.28$) based on the t-test, as shown in the table below.

Minitab Output					
Two Sample T-Test and Confidence Interval					
Two sample T for Ln-Transformed Total PCBs in Reference Area and Cedar Swamp White Perch					
	N	**Mean**	**StDev**	**SE Mean**	
Ln RA-WP	3	6.046	0.285	0.16	
Ln CS-WP	4	6.509	0.66	0.33	
95% CI for mu Ln RA-WP - mu Ln CS-WP: (-1.49, 0.56)					
T-Test mu Ln RA-WP = mu Ln CS-WP (vs not =): T = -1.25 P = 0.28 DF = 4					

Thus, all of these factors taken together support that fish in the swamp systems surrounding the BROS Property are not impacted by PCBs that might be related to the BROS Site to the extent that they pose a health concern even in the unlikely circumstance that individuals catch and consume fish from these systems.

Vapor Exposure AOCs

The AOCs presented in the EPAR (Roux, 2002) were used, to the extent possible, for the vapor intrusion assessment. However, some modifications were made to refine the exposure areas to include those that represent conditions in more highly contaminated areas (Refer to Figure 3-2). The evaluated areas include the following:

- *Soil Hot Spot 2 (Soil AOC 6)*: The soil samples and any shallow aquifer monitoring wells located in this area were evaluated as a potential future-use exposure scenario.
- *Soil Hot Spot 1 (Soil AOC 1)*: The soil samples and any shallow aquifer monitoring wells located in this area were evaluated as a potential future-use exposure scenario.
- *West Side Property (Soil AOC 5)*: The soil samples and any shallow aquifer monitoring wells located in this off-property area were evaluated as a potential future-use exposure scenario.
- *South Side Property (Soil AOC 4)*: The soil samples and any shallow aquifer monitoring wells located in this off-property area were evaluated as a potential future-use exposure scenario.
- *Remainder of BROS Property*: The soil samples and any shallow aquifer monitoring wells located in remaining areas on the BROS Site outside of Soil Hot Spot 1 (Soil AOC 1), and Soil Hot Spot 2 (Soil AOC 6) were evaluated as potential future-use exposure scenario.

The following sections provide a discussion of the mathematical equations and exposure factors used for each receptor analysis.

3.3 PATHWAY-SPECIFIC EXPOSURE EQUATIONS

A number of exposure pathways will be evaluated in this risk assessment. These include incidental ingestion of soil/sediment, dermal contact with soil/sediment, inhalation of particulates, dermal contact with ground water/surface water, inhalation of vapors, and ingestion of ground water. The following exposure equations were used to calculated exposures via these pathways.

Incidental ingestion of soil/sediment

Consistent with USEPA (1989; 2001d), the following equation was used to evaluate potential exposure resulting from the incidental ingestion of soil or sediment.

$$\text{Exposure} = \text{CS} * \text{IR} * \text{FR} * \text{OA} * \text{EF} * \text{ED} * \text{CF} * 1/\text{BW} * 1/\text{AT}$$

Where:

CS	=	Concentration in soil or sediment (mg/kg)
IR	=	Ingestion rate of soil or sediment (mg/day)
FR	=	Fraction of total ingested that is contaminated (unitless)
OA	=	Oral absorption (fraction of COPC absorbed by GI tract) (unitless)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
CF	=	Conversion factor (kg/mg)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

Dermal contact with soil/sediment

The following equation was used to evaluate potential exposure resulting from dermal contact with soil or sediment.

$$\text{Exposure} = \text{CS} * \text{DAF} * \text{SA} * \text{DA} * \text{EF} * \text{ED} * \text{CF} * 1/\text{BW} * 1/\text{AT}$$

Where:

CS	=	Concentration in soil or sediment (mg/kg)
DAF	=	Dermal adherence factor (mg/cm^2)

SA = Exposed dermal surface area (cm^2/day)
DA = Dermal absorption (fraction of COPC absorbed through skin) (unitless)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
CF = Conversion factor (kg/mg)
BW = Body weight (kg)
AT = Averaging time (days)

Inhalation of Particulates

The following equation was used to evaluate potential exposure resulting from inhalation of particulates.

Exposure = CS * RPM * IhR * ET * EF * ED * 1/BW * 1/AT * CF

Where

CS = Concentration in soil (mg/kg)
RPM = Respirable particulate matter (µg/m^3)
IhR = Inhalation rate (m^3/hour)
ET = Exposure time (hours/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (days)
CF = Conversion factor (kg/µg)

Dermal contact with ground water/surface water

The following equation was used to evaluate potential exposure resulting from dermal contact with ground water or surface water.

Exposure = CW * SA * KP * ET * EF * ED * CF * 1/BW * 1/AT

Where:

CW = Concentration in water (mg/liter)
SA = Exposed skin surface area (cm^2/day)
KP = Chemical-specific permeability coefficient value (cm/hour)

ET	=	Exposure time (hours/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
CF	=	Conversion factor (liter/cm^3)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

Inhalation of ambient vapors indoors

The following equation was used to evaluate potential exposure resulting from the inhalation of vapors in indoor air, based on the Johnson and Ettinger vapor intrusion model (USEPA, 2003b).

$$\text{Exposure} = CA * IhR * ET * EF * ED * 1/BW * 1/AT$$

Where

CA	=	Concentration in air (mg/m^3)
IhR	=	Inhalation rate (m^3/hour)
ET	=	Exposure time (hours/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

Ingestion of ground water

The following equation was used to evaluate potential exposure resulting from the ingestion of drinking water.

$$\text{Exposure} = CW * IR * FR * OA * EF * ED * 1/BW * 1/AT$$

Where:

CW	=	Concentration in water (mg/liter)
IR	=	Ingestion rate (liters/day)
FR	=	Fraction of water ingested that is contaminated (unitless)
OA	=	Oral absorption (fraction of COPC absorbed by GI tract) (unitless)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (days)

3.4 DESCRIPTION OF RECEPTORS AND EXPOSURE ASSUMPTIONS

Trespassers, groundskeepers, construction workers, utility workers, residents, recreational users, and farmers have been proposed as potential current and future exposed populations associated with the BROS Property and its off-property environs. Tables 3-3 through 3-10 summarize the exposure parameters and assumptions for each receptor and are discussed in the following sections.

3.4.1 Trespassing

There are several residential properties near the BROS Property[10] so there is the potential for trespassers to enter the BROS property. These individuals were assumed to be adolescents between the ages of 10 and 17 years,. Because there are no particularly attractive features about the BROS Property that would compel individuals to enter it without authorization, trespassing activities will be occasional and are not likely to exceed one time per month throughout the year. Thus an exposure frequency of 12 days/year every year for eight years will be assumed. It is also assumed that the length of time spent on Site will be limited to one hour. It is assumed that while on-Site, individuals are engaged in moderate levels of activity and that there is some potential for direct contact of hands, forearms, lower legs, and feet with surface soils. Exposure parameters in keeping with this level of activity include an incidental soil ingestion rate of 100 mg/day, exposed skin surface area of 5,353 cm^2, a dermal adherence factor of 0.3 mg/cm^2, and an inhalation rate of 1.2 m^3/hour. Average body weight of an adolescent is 50 kg. Table 3-3 summarizes the parameters and assumptions used to evaluate exposures to the trespasser.

3.4.2 Groundskeeping

Groundskeepers were assumed to be adults who occasionally visit the BROS Property to conduct maintenance activities, e.g., lawn care. Under current conditions, it is unlikely that these activities will occur frequently. However, should the property be developed in the future, it is possible that groundskeepers will spend one day per week on the Site from April through

[10] The closest homes to the BROS Property include one on the former orchard property and another near the juncture of Routes 44 and 295.

October. During the remaining months of the year, the ground is frozen and/or covered with snow and lawn maintenance is not necessary. Thus an exposure frequency of 30 days/year will be used and it is assumed that the individual remains on-Site for 8 hours during that workday. It will also be assumed that the groundskeeper returns every year for a total of 25 years, which is the upper bound duration of occupational exposure recommended by USEPA (1997). On-Site activities are likely to require moderate levels of exertion and it is assumed that there is potential for dermal contact with the hands, forearms and face of the groundskeeper during those activities. In line with this level of activity, other exposure parameters include an incidental soil ingestion rate of 100 mg/day, exposed skin surface area estimated at 2584 cm^2, a dermal adherence factor of 0.1 mg/cm^2, and an inhalation rate of 1.5 m^3/hour. It was also assumed that the average body weight of the groundskeeper is 71.8 kg. Table 3-4 summarizes the parameters and assumptions used to evaluate exposures to the groundskeeper.

3.4.3 Construction Work

Adult construction workers were assumed to be on-Site for five months, one month of which involves excavation for a foundation and for the installation of utilities. During the one-month excavation, construction workers may have contact with subsurface soil and ground water. After excavation is complete, exposures will be limited to surface soil, including dermal contact, incidental ingestion and inhalation of dust. Once the building is enclosed, indoor workers may also be exposed to inhalation of volatilized COPCs derived from subsurface soil or ground water. It is conservatively assumed that the same individuals are on-Site five days per week throughout the five-month period and that this exposure occurs for one year. Thus, exposure frequencies for the construction worker are as follows: 80 days (5 days/week for 4 months) for surface soil exposures via ingestion, dermal contact and inhalation of particulates. For subsurface soil exposures, the exposure frequency is 20 days (5 days/week during 1 month of excavation work). For dermal contact with ground water, 4 days/year is assumed based on 1 day/week during 1 month of excavation work. An exposure time of 8 hours (typical work day) is assumed for soil exposures and it is further assumed that the construction worker might accidentally contact the ground water for 1 hour/day. When estimating central tendency exposures (CTE), it is assumed that the exposure duration is 0.5 years rather than 1 year.

During construction activities, there is potential for contact of hands, forearms and faces with soil and of hands and forearms with ground water. Based on this level of contact, it is assumed that the exposed skin surface is 2584 cm^2 for soil contact, and that the dermal adherence is 0.3

mg/cm^2. For contact with ground water, a skin surface area of 1980 cm^2 is assumed. When estimating CTE, it is assumed that only the hands are in contact with groundwater resulting in a skin surface area of 904 cm^2. For outdoor workers engaged in moderate activity, an inhalation rate of 1.5 m^3/hour is appropriate. It was assumed that the average body weight of the worker is 71.8 kg.

Enhanced soil ingestion is possible for individuals involved in construction because of the nature of the activities involved, particularly during excavation. In the past, USEPA has relied on an enhanced soil ingestion rate of 480 mg/day based on Hawley (1985). This rate assumes that an adult, while engaged in yard work or other physical activity, ingests soil at an amount that may coat the inside surface of the fingers and thumb of one hand at a rate of 3.5 mg/cm^2. However, based on recent soil adherence data (discussed below) and the additional health and safety requirements applicable to work on the BROS Property, an alternative enhanced soil ingestion rate is more reasonable.

Hawley's adherence factor of 3.5 mg/cm^2 is based on the density of soil particles and an approximation of the depth of the layer of dust covering exposed skin, i.e., arms and hands. According to Sheppard (1995), Hawley's assumption of a 50 µm thick layer of soil on the arms and hands represents a very high and conspicuous soil load. Loads below 1 mg/cm^2 are more reasonable; soil loads greater than 1 mg/cm^2 are so noticeable that they would result in immediate attention and removal, particularly before placing hands in the mouth or handling food. More recent data provided by Kissel et al. (1996) indicate that the adherence of soil to the hands of construction workers is considerably less than the adherence rate suggested by Hawley. In fact, USEPA (2001b) recommends an upper bound adherence factor of 0.468 mg/cm^2 for the hands of construction workers and an upper bound adherence factor of 0.821 mg/cm^2 for the hands of utility workers. Using these adherence factors with the assumptions originally used by Hawley (1985) to derive his estimate, a range of enhanced soil ingestion rates of 64 to 112 mg/day results. The ingestion rate of 100 mg/day is further supported by its use by EPA in the Adult Lead Model (USEPA, 2004b). Thus for both the Construction and Utility Work scenarios, an "enhanced" soil ingestion rate of 100 mg/day[11] is used.

With regard to an appropriate PM_{10} dust level, the following discussion presents an analysis of the issue, and selects a conservative (upper-end, health- protective) PM_{10} dust level.

[11] In response to a comment from USEPA an ingestion rate of 330 mg/day will also be discussed in the risk characterization.

Development of PM_{10} Value for On-Site Excavation

USEPA's *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA, 2001d) provides a methodology for calculating PM_{10} levels in air during construction activities such as excavation and tilling, activities that could occur if building renovation or construction were undertaken on the BROS Property in the future.

In lieu of this approach, regional data for PM_{10} was evaluated. The average PM_{10} concentrations reported at 10 monitoring locations in New Jersey ranged from 21.7 to 37.4 $\mu g/m^3$ (NJDEP, 2001)[12] but these values did not necessarily reflect construction activities. Therefore, for conservatism, the PM_{10} concentration was set to the maximum allowable 24-hour PM_{10} concentration of 150 $\mu g/m^3$ (NJDEP, 2001) for the construction scenario. This value was used to calculate particulate exposure during excavation activities on-property.

Parameters and assumptions associated with RME exposures for the construction worker are presented in Table 3-5a and CTE exposure parameters and assumptions are summarized in Table 3-5b.

3.4.4 Utility Work

It is assumed that utility installation or repair may occur on the Site in the future. Such repairs/installations would, however, be brief in duration. Thus for this scenario it is assumed that a Utility Worker is present on the Site daily for one work week (5 days), 8 hours each day. During that time, this individual may be exposed to subsurface soil and surface soil. Since it is unlikely that utilities would be placed below the soil/ground water interface[13], it is assumed that these workers will have no direct contact with ground water. When conducting repair work, it is assumed that face, hands and forearms are in contact with soil. Based on this level of contact, it is assumed that the exposed skin surface is 2584 cm^2, and that the dermal adherence is 0.9 mg/cm^2. In addition, an incidental ingestion rate of 100 mg/day and an inhalation rate of 1.5 m^3/hour are assumed. Exposure parameters and assumptions used to evaluate the Utility Worker scenario are provided in Table 3-6.

[12] The NJDEP air monitoring stations included two in Atlantic City, two in Camden, and one each in Elizabeth, Fort Lee, Jersey City, Newark, Pennsauken, and Trenton. Additional summary data are available at http://www.state.nj.us/dep/airmon/part01.pdf

[13] Typical a depth of 3 feet below grade would be sufficient for utilities to be out of the frost zone in this part of New Jersey. Depth to ground water site-wide averages 4 feet or greater (Roux, 2003).

3.4.5 Industrial/Commercial Work

If the BROS Property is developed in the future for commercial/industrial use, there is potential for individuals working in on-property buildings to be exposed to vapors released from the underlying soil and ground water into the indoor air. Thus the vapor inhalation pathway will be evaluated for this scenario. At the request of EPA, the Johnson & Ettinger vapor intrusion model was used for this assessment, which does not allow adjustments for inhalation rates or less than a 24 hour day adjustments for exposure inputs. Specific exposure assumptions and parameters are provided in Table 3-7.

3.4.6 Residential Use

It is assumed that a resident living in off-property areas may, at some point in the future, develop a ground water well to provide water for household uses. If this hypothetical scenario were to occur, children and adults might be exposed to volatile COPCs in the ground water while showering or bathing. In addition, it is conceivable that these residents might use the water as a drinking water source. Thus, for this scenario, the ingestion of ground water, inhalation of vapor while showering/bathing, and dermal contact during showering/bathing are evaluated. For both the non-cancer and cancer risk estimates, children under the age of six are evaluated separately from older children and adults to ensure that their smaller body weights do not place them at greater risk. For the cancer risk estimate, it is conservatively assumed that individuals remain in their home for a total of 30 years, from 0 to 30 years, and exposure estimates are summed for the 30-year period. Specific exposure parameters and assumptions for RME exposures are provided in Table 3-8a and parameters and assumptions for CTE exposures are provided in Table 3-8b.

3.4.7 Restricted Recreation

With Swindell Pond and adjacent land under the control of the New Jersey Green Acres program, and the possibility that other adjacent properties to BROS may also be added to the Green Acres Program, it is reasonable to assume that recreational users may occasionally visit the BROS Property and its environs during recreational activities that focus on these areas. Recreational users may range in age from young children to adults. It is not expected, however, that infants will have contact with media associated with the BROS Property. Thus for this scenario, children aged 1-6 years and older children/adults will be evaluated. As a conservative assumption, an upper bound residence time of 30 years will be used as the exposure duration.

It will be assumed that there is potential for direct contact (ingestion and dermal contact) with surface soils and sediments. In addition, there may be dermal contact with surface water and sediment. Finally, while unlikely given the known nature of ground water quality in this area, but consistent with the State use designation of the aquifer, it is conceivable that a water fountain might be installed in these off property locations to accommodate hikers, recreators, and similar individuals. Thus there is also potential for exposure due to the ingestion of ground water. The specific exposure parameters and assumptions used to evaluate RME exposures for recreational users are provided in Table 3-9a and parameters and assumptions for CTE exposures are summarized in Table 3-9b.

Consumption of Field Game

Consistent with the methodology laid out in the EPAR (2002), the potential for exposure to COPCs via human ingestion of field game is qualitatively addressed through a multiple lines-of-evidence approach for two species, deer and snapping turtles. A Site-specific bioavailability assessment (discussed in more detail below) was conducted in conjunction with the RI, and was presented in the BROS ecological risk assessment (ERA), submitted to USEPA on April 25, 2003 (Annex E to Appendix O of RI Report). The study included tissue analysis of small mammals in LTCS and Cedar Swamp, and concluded that the bioavailability of COPCs at the BROS Site is low to insignificant when compared to estimates from bioaccumulation models and background levels (AMEC, 2003).

Snapping Turtles

During the small mammal field investigation (December 2000), field scientists reported that one person expressed an interest in the snapping turtle population in AOC LTCS-H3 (between Cedar Swamp Road and Route 44). It is not known whether the person intended to trap turtles for food, however the presumption in this risk assessment is that this could occur[14]. The turtle species that might possibly be used for human consumption is the snapping turtle (*Chelydra serpetina*), and, while potentially present in AOC LTCS-H3, snapping turtles are known for limited capacity to live outside of standing water (Shaffer and McCoy, 1991; Dove and Nyman, 1995). In AOC LTCS-H3, all but a small area (approximately 1000 square feet) contains no

[14] It is noteworthy that a Year 2002 Delaware River Creel Survey (PF&BC, 2003) was conducted consisting of an access point survey in conjunction with an aerial effort survey. The purpose of survey was to estimate effort, catch and harvest of fish and other species (including turtles). Only 5 turtles (unspecified species) were captured. This suggests that the practice of turtle harvesting is not a common activity, even among larger, more productive, water bodies such as the Delaware River and its longer tributaries that were estimated to have had 120,042 angler trips over the total study period (March through October 2002).

standing water for around 6 months out of the year and no snapping turtles were observed in this culvert pool during repeated biotic surveys and periodic site inspections by the Project Coordinator for the Settling Defendants. The rest of Little Timber Creek Swamp is similarly dry. Thus, snapping turtles that might be present in and around AOC LTCS-H3 have only spent a small portion of their life spans in AOC LTCS-H3. Most, if not all, snapping turtles would be migrants from areas that are permanently inundated and where deep water habitats are available (Dover and Nyman, 1995), such as the area to the north in portions of Cedar Swamp and the Delaware River. Also, environmental conditions in AOC LTCS-H3, such as the lack of a significant fish population (AMEC, 2003) and aquatic vegetation, key components of the snapping turtles' diet, are not favorable to supporting snapping turtle populations (Conant and Collins, 1991; Shaffer and McCoy, 1991; Dove and Nyman, 1995; AMEC, 2003). No snapping turtles were observed anywhere in Little Timber Creek Swamp or in Little Timber Creek in Cedar Swamp during the multiple weeks of field collections of sediments and surface water, or during the surveys of ecological resources in the area (AMEC, 2003). Consequently, there is no known or projected snapping turtle population in the LTCS-H3 to support the analysis of a snapping turtle exposure pathway.

Moreover, a number of sediment removal actions are planned for areas of known elevated chemical residuals as ecological risk reduction measures, including the limited areas near culverts where some water remains during the summer and other smaller species of turtles have been observed at times. Specifically, soil/sediments will likely be removed from the *De Manifestis Zone*[15] (DMZ) culvert areas to a depth of at least 1 foot and replaced with clean fill stabilizing rock substrates[16]. Consequently, the potential source of BROS-related constituents in sediments and soil in areas where a snapping turtle could be present will be eliminated.

Below is additional detail of planned removal actions in locations where snapping turtles may be located.

Deer

Some deer hunting stands are apparent in portions of Little Timber Creek Swamp north of Route 130. Deer prefer a diversified habitat and the radius of deer home range is greater than

[15] The DMZ is defined in the BROS Ecological Risk Analysis Report (AMEC, 2003). This document addresses ecological risks to individuals, populations, or communities that have special legal protection (e.g., threatened or endangered species) or local value (e.g., wetlands).

[16] This information was presented in the BROS ERA (AMEC, 2003) report, which has been reviewed by USEPA and is in the final approval phase.

200 hectares (NJDEP, 2004) and up to several square miles (Doutt, et al., 1977; Dove and Nyman, 1995), much larger than the AOCs combined in LTCS. Consequently, the deer frequenting LTCS spend much of their time feeding in adjacent upland areas that are unaffected by BROS-related chemicals. The literature describes life habits that are consistent with the observations made during the field investigations. Signs of deer (tracks, trails, browsing) were primarily observed around the perimeter of the swamp rather than in the swamp. In addition, a typical mouse (0.03 to 0.07 pounds) has a body mass about 0.03% of a deer (100 to 300 pounds; Doutt, et al., 1977). The occasional potential for exposure to the deer and anyone consuming a deer over several years is offset by a large body mass that would dilute the actual dose substantially compared to a mouse. Therefore, the small mammals would be predicted to better reflect the bioaccumulation potential of site chemicals, which is also why they are commonly used as sentinel species for potential site exposures (e.g., Rowley et al., 1983; Talmage and Walton, 1991).

As noted above, a Site-specific bioavailability assessment was conducted as a component of the ERA. That study concluded that the bioavailability of BROS-related chemicals is low in LTCS (nearly the same as background on average), even for small mammals whose home ranges are small (e.g., 0.06 hectare for the white-footed mouse; Sample and Suter, 1994), limited to LTCS for the small mammals collected in these areas, and whose activities and food materials (plants and insects) bring them into nearly constant contact with the BROS-related chemicals remaining in the swamp (AMEC, 2003). Deer feed primarily on vegetation that extends above the ground surface, such as browse including twigs and leaves (Dove and Nyman, 1995; Benyus, 1989; Doutt, et. al., 1977; Palmer and Fowler, 1975; Sample et al., 1997; Snyder, 1991). They will eat some grasses but grasses are not a significant part of the LTCS flora (AMEC, 2003). Thus, deer have limited potential for exposure to elevated concentrations of BROS-related chemicals that occur in the sediment and are not readily accumulated in plants above the roots especially with chemicals such as PCBs (Samsøe-Petersen et al., 2002). It follows then that deer are predicted to be less efficient accumulators of BROS-related constituents compared to small mammals that eat both insects and plant material in direct contact with the sediment. Moreover, since the conclusion in the ERA was that the more highly exposed small mammals that spend all their time in LTCS and Cedar Swamp do not bioaccumulate COPCs at levels that might pose a significant risk, the potential magnitude of exposure from the deer ingestion pathway is low and cannot be regarded as potentially significant. For these reasons, the deer consumption pathway was not subject to further quantitative evaluation in this HHRA.

3.4.8 Agriculture

It is assumed that during future farming activities, ground water may be used as a source of irrigation for local crops. For the RME case, which would reflect drought conditions, it is assumed that irrigation will only be necessary three times per week, on average, throughout 6-month growing season. Therefore, an RME exposure frequency of 72 days/year is utilized based on assumed irrigation frequency of 3 days/week during six months of the year. For the CTE case, since there is regular precipitation in New Jersey which may be supplemented by irrigation only during certain portions of the growing season (e.g., drier periods during August), a CTE exposure frequency of 12 days per year was assumed. This is based on an irrigation frequency of 1 day/week over a period of three months.

While adults would not be expected to spend time in the irrigation spray, it is possible that young children might run through it while it is happening so that total dermal contact is possible for them. Dermal contact with irrigation water is expected to occur after the irrigation is complete but while the plants and ground are still wet. It is further assumed that when irrigation occurs, it will require one hour of time each day so that vapor inhalation exposures for adults and children and dermal contact for young children will be of that duration. Specific exposure parameters and assumptions used to evaluate the RME exposures for the Agricultural scenario are provided in Table 3-10a and parameters and assumptions for CTE exposures are presented in Table 3-10b.

3.4.9 Absorption Factors (Bioavailability)

Bioavailability describes the extent to which a substance is capable of being absorbed and available to interact metabolically. Bioavailability is a chemical-specific and pathway-specific parameter.

In its dermal guidance, USEPA (2001b) provides chemical-specific data on oral and dermal absorption of chemicals in soil as well as data on permeability coefficients that measure the dermal flux of chemicals present in water. This guidance also recommends default values in the absence of chemical-specific data. Another source of bioavailability data is the Oak Ridge National Laboratory (ORNL, 2003) online database, which provides chemical-specific

information including oral and dermal absorption efficiencies, and permeability coefficients[17]. Both of these sources were consulted to determine chemical-specific dermal and oral absorption factors and permeability coefficients for the BROS HHRA. When a chemical-specific value differed between USEPA (2001b) and ORNL (2003), we selected the USEPA value. In cases where USEPA (2001b) did not provide a chemical-specific value, we used the value provided by ORNL; any COPC that was identified as a risk driver and which used absorption factors provided by ORNL is discussed in the uncertainty section. In line with USEPA (2001b) guidance, dermal exposure associated with volatile compounds in soil was not evaluated and thus did not present dermal absorption values for these compounds. USEPA assumes that the compounds tend to volatize from soil and exposure is accounted for via the inhalation pathway.

Table 3-11 summarizes the chemical-specific oral and dermal absorption values and permeability coefficients.

3.5 EXPOSURE ESTIMATES

This section presents non-cancer and cancer exposure estimates based on the exposure point concentrations and exposure parameters discussed in the previous sections. These estimates of exposure or intakes are provided for each exposure pathway for utility worker and trespasser scenarios. Intakes are modeled either as a lifetime average daily intake (cancer risk estimates) or as an average daily intake (non-cancer risk estimates). Both are expressed in units of milligrams of chemical per kilogram body weight per day (mg/kg-day).

3.5.1 Exposure via Volatilized Chemicals

Ambient air exposures were not quantitatively assessed. Air monitoring performed during the lagoon excavation and remediation found that ambient air concentrations of BROS-related constituents were below Federal and New Jersey Ambient Air Standards (Roux, 1999a), thereby eliminating the need for further study of ambient air exposures. Due to the presence of BROS-related chemical constituents that can volatilize in soil and ground water on and in proximity to the BROS property, this HHRA evaluates the potential for exposure to BROS-related constituents in indoor air. The potential dynamics of COPCs to move from soil, ground water or LNAPL into indoor air environments are described below.

[17] This information is updated monthly by ORNL and can be found at http://risk.lsd.ornl.gov/tox/tox_values.shtml

3.5.1.1 Model Selection

At the request of USEPA[18], the Johnson and Ettinger vapor intrusion model ("J&E Model"; USEPA, 2003b; Johnson and Ettinger, 1991) was used to assess potential indoor air exposures to volatilized chemicals [19]. The J&E Model was developed for use as a screening level model and includes a number of simplifying assumptions regarding contaminant distribution and occurrence, subsurface characteristics, transport mechanisms, and building construction. EPA has also recently reviewed vapor intrusion models and has identified conditions that would preclude the use of the Johnson and Ettinger model, such as subsurface features that act as preferential pathways such as buried utility lines and landfills or non-homogenous subsurface materials (USEPA, 2002e).

Although certain confounding factors such as a very shallow groundwater table that exist at the BROS site make the results of the Johnson and Ettinger model difficult to apply, the presence of NAPL and the high levels of contaminants suggest the potential for vapor intrusion exists at the site. However, since no buildings currently exist in the areas most likely to be impacted by vapor intrusion, this potential issue would be of concern only with certain future scenarios, such as if a commercial or industrial building were to be developed over or near the areas with high VOC concentrations in the subsurface or where NAPLs are present at relatively shallow depths.

Briefly, the model incorporates both convective and diffusive mechanisms for estimating the transport of contaminant vapors emanating from either subsurface soils or ground water into indoor spaces located directly above the chemical source. Inputs to the model include the chemical concentrations in soil and ground water, the physico-chemical properties of the chemical, saturated and unsaturated zone soil properties, and structural features of the building. Physico-chemical data for the evaluated chemicals were obtained from the J&E Model Users Guide (USEPA, 2003b), an on-line source (ORNL, 2003), the NJDEP Division of Air Quality (NJDEP, 2003) and other literature (Chickos and Acree, 2003; Locke, 2002; Puri et al., 2001). Information concerning the chemical concentration inputs, saturated and unsaturated zone soil

[18] The use of the J&E Model was discussed at a meeting between EPA and the BROS Technical Committee and their consultants on 12 June 2003.

[19] The MS-Excel spreadsheets released by USEPA in June 2003 based on the J&E Model (version 3, dated February 2003) were modified slightly to allow batch processing of chemicals. These included spreadsheet models to calculate the vapors released from vadose zone soils and ground water.

properties, and structural features of the building are discussed with the specific exposure scenarios. The key items that apply across all scenarios are summarized below:

- The J&E Model was run for all chemicals with a detection frequency of at least 5% in the media associated within the particular area or AOC being evaluated. If fewer than 20 samples were available in the evaluated dataset, then this detection frequency screen was not performed. No other chemical screening was performed.

- For the soil or ground water concentration EPCs, the 95% UCL - which was either the H-UCL or the maximum observed concentration - were used. This approach is conservative in that most soil samples were biased to areas with higher concentrations of COPCs. The media concentration inputs are summarized in tables provided in Annex A.

- For soils data, the 0 to 6 ft depth interval was selected as representative of the zone of likely influence of contaminants on indoor air. This depth is typical of the vadose zone in the evaluated areas. Multiple sampling depths were treated as independent samples for all calculations. For ground water, only data designated as originating from the shallow aquifer (water table) wells were used. Multiple sampling rounds were treated as independent samples for all calculations.

- Soil samples were only collected from soil boring intervals that exhibited the presence of volatiles using field screening methods (Roux, 1999b). Therefore, the soil inputs to the J&E Model would be conservative estimates of the soil conditions at the BROS Site. Similarly, ground water wells were located in a biased manner, such that the ground water inputs to the J&E Model would be conservative estimates of the ground water conditions at the BROS Site.

- The default assumptions for the risk calculations in the J&E Model were adjusted to represent industrial or commercial exposures for future-use conditions (Table 3-12). The risk estimates generated by the J&E model are still conservative as they assume a 24-hr (residential-like) per day exposure.

- Three soil strata were used, all meeting the SCS criteria for sand. This is a conservative approach, since soils from portions of the BROS property could be classified as sandy loam, which would have greater retentive properties for soil vapors and therefore allow less vapor to pass indoors.

The J&E Model includes a version to evaluate a LNAPL source (J&E NAPL Model), but it is used only if the LNAPL is present in soil. The J&E LNAPL Model determines whether LNAPL can be present in the vadose zone soils based upon the soil concentrations and physical

characteristics of the soils (USEPA, 2000). The J&E LNAPL Model cannot be used to assess ground water that includes a free LNAPL phase. Using worst-case soil concentrations – the maximum soil results from Soil Hot Spot 2 – as inputs to the J&E LNAPL model, the model confirmed that the individual COCs are not present as NAPL in these soils. The VOC COPCs comprise less than 1% of the LNAPL mass found at the Site. Under these situations, the J&E LNAPL Model Users Guide (USEPA, 2000) recommends that the soil and ground water vapor intrusion models be used. This guide also indicates that use of the ground water model when NAPL is present would overestimate the soil vapor concentrations (and subsequent building concentrations). Therefore, the soil- and ground water-based J&E Models would result in conservative estimates of the potential risk for the current assessment, and are thus appropriate for use in this HHRA.

3.5.1.2 Evaluated Areas for Vapor Intrusion Modeling

The AOCs presented in the EPAR (Roux, 2002) were used, to the extent possible, for the vapor intrusion assessment. However, some modifications were made to refine the exposure areas to include those that represent conditions in more highly contaminated areas (Figure 3-3).

The currently existing structure[20], the Pepper Building, was not assessed for vapor intrusion. The Pepper Building has a partial slab flooring and is in general disrepair (e.g., broken windows, holes in roof, and other structural problems). In addition, these structural features preclude the accumulation of vapors within the building structure (Photographs 1-1 and 1-2). Consequently the Pepper Building was not assessed further for the vapor intrusion evaluation.

The evaluated areas include the following:

- *Soil Hot Spot 2 (Soil AOC 6)*: The soil samples and any shallow aquifer monitoring wells located in this area were evaluated separately from the Pepper Building as a potential future-use exposure scenario.

- *Soil Hot Spot 1 (Soil AOC 1)*: The soil samples and any shallow aquifer monitoring wells located in this area were evaluated as a potential future-use exposure scenario.

- *West Side Property (Soil AOC 5)*: The soil samples and any shallow aquifer monitoring wells located in this off-Site area were evaluated as a potential future-use exposure scenario.

[20] There are also temporary trailers used as field support during the RI on the BROS property that do not have foundations or underlying slabs. These will not be evaluated as part of this exposure pathway, since they are elevated off of the ground surface with concrete blocks, allowing ample air exchange that prevents any significant vapor accumulation. In addition there are several enclosures over USEPA product recovery systems which were no included in this evaluation as activity in these structures is regulated under a Site-specific HASP.

- *South Side Property (Soil AOC 4)*: The soil samples and any shallow aquifer monitoring wells located in this off-Site area were evaluated as a potential future-use exposure scenario.

- *Remainder of BROS Property*: The soil samples and any shallow aquifer monitoring wells located in remaining areas on the BROS Site outside of the Pepper Building vicinity, Soil Hot Spot 1 (Soil AOC 1), and Soil Hot Spot 2 (Soil AOC 6) and the Former Lagoon Area (represented by ground water from MW-26S) were evaluated as a potential future-use exposure scenario.

  The area of monitoring well MW-26S was evaluated separately from the rest of the BROS property since it is situated in an area near a portion of the former lagoon at its deepest point during waste disposal where significant COPC residuals remain. Based on ground water and deep soils data, residual concentrations in source material remain substantially higher than on the remainder of the BROS Property. Therefore, MW-26S represents an isolated area of elevated ground water concentrations and has been evaluated separately for the vapor intrusion risk analysis.

The exposure assumptions for the evaluated areas and present- and future-use scenarios are presented in the sections below. The input concentrations are summarized in Annex A, Tables A-1 through A-11. Table A-12 summarizes the soil properties used in the J&E model. Tables A-13a and A-13b summarize the assumptions, and compare these assumptions to the default Johnson and Ettinger model assumptions, for the soil and groundwater submodels, respectively. The outputs from the J&E Model are detailed in Annex A, Tables A-14 through A-19.

3.5.1.3 Potential Future-Use Scenario, Hot Spot 2 On-Property Indoor Air Exposure Pathway (Hypothetical Structure)

If a new structure were to be erected on the BROS property[21], yet still within the influence of current levels of BROS-related chemical constituents in soil, ground water or LNAPL, the potential also exists for exposure to volatilized chemicals into the structure. This pathway is conservative, since it is likely that any construction of buildings on the BROS property would occur following implementation of remedial measures that would reduce or eliminate the BROS-related chemical constituents from the source media, and that this construction would occur outside of areas of active remediation or include a vapor mitigation system[22]. The key components of this exposure pathway include the following:

[21] The current BROS property deed with its recorded restrictions limits redevelopment to commercial and light industrial uses.

[22] The term "active remediation refers to any long-term treatment system, such as ground water treatment systems that may have above-ground structures such as air strippers or treatment trains.

- The general input assumptions for this scenario are summarized in Table 3-13. Unless noted, the default assumptions of the J&E Model were used.

- A 1,000-sq ft building was assumed for these calculations. This building size was selected since it readily allows sizing-up to larger structures.

- The input concentrations for ground water were from monitoring wells located within 50 to 75 feet of Soil Hot Spot 2 (Soil AOC 6) as shown on Figure 1 from the SCS Report (Roux, 2002). Soils data reflect only the 0-6 foot depth interval from Soil Hot Spot 2 (Soil AOC 6). The input concentrations for the ground water and soil media are compiled in Annex A, Tables A-4 and A-5, respectively.

- An adult commercial worker was evaluated as the receptor for this scenario.

3.5.1.4 Potential Future-Use Scenario, Soil Hot Spot 1 On-Property Indoor Air Exposure Pathway (Hypothetical Structure)

This pathway is similar to *Potential Future-Use Scenario, Soil Hot Spot 2 On-Property Indoor Air Exposure Pathway (Hypothetical Structure)*, but evaluates Soil Hot Spot 1. The key components of this exposure pathway include the following:

- The general input assumptions for this scenario are summarized in Table 3-13. Unless noted, the default assumptions of the J&E Model were used.

- A 1,000-sq ft building was assumed for these calculations. This building size was selected since it readily allows sizing-up to larger structures.

- The input concentrations for ground water were from monitoring wells located within 50 to 75 feet of Soil Hot Spot 1 (Soil AOC 1) as shown on Figure 1 from the SCS Report (Roux, 2002). Soils data reflect only the 0-6 foot depth interval from Hot Spot 1 (Soil AOC 1). The input concentrations for the ground water and soil media are compiled in Annex A, Tables A-6 and A-7, respectively.

- An adult commercial worker was evaluated as the receptor for this scenario.

3.5.1.5 Future-Use Scenario, West Side Property (Off-Property) Indoor Air Exposure Pathway (Hypothetical Structure)

The focus of this exposure pathway was the West Side Property just outside but proximal to the BROS Property. This exposure pathway is not relevant to areas located further off of the BROS property where there is no soil or water table ground water that was influenced by activities related to the BROS Site. The key components of this exposure pathway include the following:

- The general input assumptions for this scenario are summarized in Table 3-13. Unless noted, the default assumptions of the J&E Model were used.

- A 1,000-sq ft building was assumed for these calculations. This size was selected since it readily allows sizing-up to larger structures.

- The input concentrations for ground water were from monitoring wells located within 50 to 75 feet of the West Side Property. Soils data reflect only the 0-6 foot depth interval from Soil AOC–5. The input concentrations for the ground water ground water and soil media are compiled in Annex A, Tables A-8 and A-9, respectively.

- An adult commercial worker was evaluated as the receptor for this scenario.

3.5.1.6 Future-Use Scenario, South Side Property (Off-Property), Indoor Air Exposure Pathway (Hypothetical Structure)

The focus of this exposure pathway was the South Side Property just outside but proximal to the BROS Property since this exposure pathway is not relevant to areas located further off of the BROS property where there is no soil or water table ground water that was influenced by activities related to the BROS Site. The key components of this exposure pathway include the following:

- The general input assumptions for this scenario are summarized in Table 3-13. Unless noted, the default assumptions of the J&E Model were used.

- A 1,000-sq ft building was assumed for these calculations. This size was selected since it readily allows sizing-up to larger structures.

- The input concentrations for ground water were from monitoring wells located within 50- to 75-ft of the South Side Property. Soils data reflect only the 0-6 foot depth interval from AOC Soil-4. The input concentrations for the ground water and soil media are compiled in Annex A, Tables A-10 and A-11, respectively.

- An adult commercial worker was evaluated as the receptor for this scenario.

3.5.1.7 Potential Future-Use Scenario, Remainder of BROS Property, Indoor Air Exposure Pathway (Hypothetical Structure)

This pathway is similar to *Potential Future-Use Scenario, Soil Hot Spot 2 On-Property Indoor Air Exposure Pathway (Hypothetical Structure)*, but evaluates soils and ground water that were not included in the two on-Site Soil Hot Spots or the Pepper Building Vicinity assessment. The key components of this exposure pathway include the following:

- The general input assumptions for this scenario are summarized in Table 3-13. Unless noted, the default assumptions of the J&E Model were used.

- A 1,000-sq ft building was assumed for these calculations. This building size was selected since it readily allows sizing-up to larger structures.

- The input concentrations for ground water were from on-property monitoring wells that were not located in the aforementioned areas. Soils were from on-property locations not located in other evaluated areas, and reflect only the 0-6 foot depth interval. The input concentrations for the ground water and soil media are compiled in Annex A, Tables A-12 and A-13, respectively.

- An adult commercial worker was evaluated as the receptor for this scenario.

4.0 TOXICITY ASSESSMENT

Toxicity assessment is the process of characterizing the relationship between the dose of an agent administered or received and the incidence of an adverse health effect in an exposed population. Dose-response relationships are developed on the basis of animal studies and theoretical precepts about what might occur in humans or on the basis of human epidemiological evidence when adequate data are available. The end result of the toxicity assessment is the determination of human uptake levels that provide a certain measure of protection to exposed persons for cancer and non-cancer endpoints.

A reference dose (RfD), expressed in units of mg/kg-day, is an estimate of daily exposure to the human population, including sensitive subgroups, that is likely to be without appreciable risk of adverse non-cancer effects over the course of a lifetime (USEPA, 1988). For chemicals classified as known human carcinogens, probable, possible, or likely human carcinogens, a toxicity value for cancer potency is derived from the dose-response data. Where available, human epidemiological data are preferable to animal data in deriving this toxicity value, known

as a cancer slope factor (CSF). The CSF that is used by the USEPA is typically the 95 percent upper confidence limit on the probability of a response per unit intake of a chemical over a lifetime, and is expressed in units of $(mg/kg\text{-}day)^{-1}$. As discussed below, the J&E model uses an algebraic expression of the CSF for inhalation exposures, known as the Unit Risk Factor (URF; $[\mu g/m^3]^{-1}$) to estimate potential cancer effects. In an analogous fashion, the J&E model uses an algebraic expression of the RfD for inhalation exposures, called the Reference Concentration (RfC; mg/m^3), to estimate potential non-cancer risks.

For this assessment, chemical-specific toxicity factors available from USEPA's Integrated Risk Information System (IRIS) were incorporated. For chemicals where IRIS values were unavailable, provisional toxicity criteria developed through USEPA/NCEA or toxicity values available from the HEAST database were utilized in consultation with the USEPA. No toxicity criteria were available from these sources for the following chemicals: lead, acenapthylene, benzo(g,h,i)perylene, phenanthrene, 4-chloro-3-methyphenol, and *cis-* and *trans-* 1,3-dichloropropene. These chemicals were submitted to USEPA in order for USEPA to provide guidance on their toxicity. A request was submitted June 2, 2005. Since provisional toxicity values were not made available by EPA prior to preparing the revised HHRA, these chemicals were not evaluated quantitatively in the revised HHRA.

Table 4-1 summarizes the chemical-specific toxicity factors used in the BROS HHRA. Due to the lack of dermal toxicity factors, it is necessary to rely on oral toxicity factors when evaluating risks from dermal exposure. For certain chemicals, the oral toxicity criteria require an adjustment to represent an absorbed rather than an administered dose. Most oral RfDs and CSFs are expressed as the amount of substance administered in comparison to dermal exposure estimates that are expressed as absorbed doses (USEPA, 2001b – Dermal Guidance). When oral absorption of a chemical is poor, the absorbed dose is much less than the administered dose and the toxicity factors are adjusted to account for this difference. USEPA (2001b) recommends adjusting the oral toxicity criteria for those chemicals with an oral absorption less than 50 percent.

Using USEPA's guideline of 50 percent, oral toxicity criteria were adjusted for the following chemicals: aluminum, barium, beryllium, copper, iron, manganese, nickel, vanadium, zinc, chlorobenzene, chromium, and bis(2-ethylhexyl)phthalate. Multiplying the oral RfD by the oral absorption percentage adjusts the oral RfD. Dividing the oral CSF by the oral absorption value

adjusts the oral CSF. The adjusted oral toxicity criteria are summarized in Table 4-2. These adjusted criteria are only used to estimate risks associated with dermal exposure.

Vapor Intrusion Modeling

The J&E vapor intrusion model relies upon the Unit Risk Factor (URF; $[\mu g/m^3]^{-1}$) to estimate potential cancer risks, and the Reference Concentration (RfC; mg/m^3) to estimate potential non-cancer risks. The toxicity values for the evaluated chemicals were obtained from the J&E Model Users Guide (USEPA, 2003b), an on-line source (ORNL, 2003), and other literature (e.g., Locke, 2002).

Several of the evaluated chemicals lacked toxicity data. These were also lacking URF or RfC values in IRIS and HEAST. A request was submitted June 2, 2005. Since toxicity values were not made available by EPA prior to preparing the revised HHRA, toxicity data from structurally related chemicals were used, as described below:

- Benzo(b)fluoranthene was used as a toxicity surrogate for benzo(g,h,i)perylene.
- Naphthalene was used as a toxicity surrogate for phenanthrene.
- Bis(2-ethylhexyl)phthalate was used as a toxicity surrogate for di-n-octyl phthalate.
- Total PCBs were evaluated using the URF for the individual Aroclor-PCBs [5.7E-04 $(\mu g/m^3)^{-1}$]. The physico-chemical parameters for Aroclor-1260 were used to assess the transport of total PCBs from the soil or ground water to the overlying air. Aroclor-1260 was selected since this Aroclor group was the predominant PCB in the total PCB concentrations reported at the Site.

5.0 Risk Characterization

Risk characterization is the final step of the baseline risk assessment whereby the toxicity and exposure assessments are summarized and integrated into qualitative and quantitative expressions of risk (USEPA, 1989). In this section, cancer and non-cancer health risks are estimated for each exposure scenario for each AOC. The calculations that follow present hypothetical cancer and non-cancer risk estimates for the upper-end RME individual. In cases where RME risk results demonstrate an exceedance of acceptable cancer and non-cancer risk

benchmarks (discussed below), CTE exposure calculations are provided to determine if more moderately exposed individuals would also exceed applicable risk benchmarks. Potential cancer risks are estimated by multiplying the exposures (doses) derived for each chemical by the chemical's cancer slope factor. For potential excess lifetime cancer risks, USEPA's acceptable risk range is between one-in-ten-thousand and one-in-a-million (1×10^{-4} to 1×10^{-6}). Cancer risks less than or equal to 1×10^{-6} are characterized as acceptable, without consideration of risk management alternatives. Potential non-cancer risks are estimated by dividing the chemical doses by the chemical's reference dose (RfD). This ratio is referred to as a hazard index (HI). The Hazard Quotient (HQ) is the sum of the individual HI values for the different chemicals. An HI (or HQ) of 1 or less is considered an acceptable level. Cancer and non-cancer risk estimates are summarized in Tables 5-1 through 5-12b. Source calculation tables for each receptor can be found in Annex B, Tables B-1 through B-84b. It must be recognized that for on BROS Property and areas on adjacent properties, the influences of the widespread occurrence of free and residual LNAPL (and associated chemical constituents such as PCBs) on the risk estimates is substantial. The concentrations and estimated exposures associated with soils and shallow ground water are low, except where free and residual LNAPL is present (See Chapters 4 and 5 of RI).

The calculated cancer or non-cancer risks that were above their respective thresholds are shown in bold in the risk summary tables provided in this section. When RME cancer or non-cancer risks were below their respective risk thresholds, the CTE risks were not evaluated since these risks would be lower than those calculated under the more highly conservative RME case. Therefore, "NE" under the CTE refers to "not evaluated."

5.1 SOIL AOC BP/SHALLOW GW AOC 1A POTENTIAL RISKS

Potential cancer and non-cancer risks associated with current and future exposures to surface soil for AOC BP were evaluated for a teenage trespasser (Table 5-1) and an adult groundskeeper (Table 5-2). Potential cancer and non-cancer risks associated with current and future exposures to surface and subsurface soil for AOC BP were evaluated for an adult construction and utility worker (Tables 5-3a and 5-4, respectively). Risks associated with current and future direct contact exposures to shallow ground water for AOC 1A were evaluated for the construction worker (Table 5-3b).

Detailed risk calculations are provided in the following Annex B tables for the Soil AOC BP and shallow groundwater GW AOC 1A:

Pathway	Trespasser	Groundskeeper	Construction Worker	Utility Worker
Soil: Ingestion and dermal contact	B-2	B-6	B-17, B-18	B-36, B-37
Soil: Dust inhalation	B-4	B-8	B-25	B-44
GW: Dermal contact			B-26a, B-26b	

The surface soils (0 to 0.5 ft) were summarized separately from the subsurface soils (0 to 6 ft) since (a) the latter includes the surface soil results in the calculation of the EPCs, and (b) the dust inhalation soil EPCs were based on the subsurface soils only.

In addition to the exposure pathways quantitatively evaluated, exposure to vapors in ambient air may occur. However, due to the site-specific conditions that exist in this area, i.e., no buildings currently exist, significant dilution associated with vapors in ambient air, risks from this exposure pathway are likely to be insignificant and are not quantitatively evaluated, consistent with the ambient air monitoring conducted by the USEPA during the lagoon removal work.

5.1.1 Soil AOC BP, Surface Soils (0 to 0.5 ft)

For the teenage trespasser scenario, potential cancer risks were evaluated for three chemicals and potential non-cancer risks were evaluated for nine chemicals, from surface (0 to 0.5 ft) soils. The cumulative risk results for this receptor are summarized in the table below:

Receptor	Exposure	Surface Soil - Based	
		Cancer	Non- Cancer
Trespasser	RME	1.3E-07	1.8E-02
	CTE	NE	NE

The total cancer RME risk was below the threshold of 1 x 10^{-6} and the total non-cancer risk was well below a hazard index of one (Table 5-1). Because the RME exposures for this receptor fell below the established risk thresholds, CTE exposures were not evaluated.

For the groundskeeper scenario, potential cancer effects were evaluated for arsenic only, and the potential non-cancer risks were evaluated for four chemicals, from surface (0 to 0.5 ft) soils. The cumulative risk results for this receptor are summarized in the table below:

Receptor	Exposure	Surface Soil - Based	
		Cancer	Non- Cancer
Groundskeeper	RME	5.8E-07	1.8E-02
	CTE	NE	NE

The cancer RME risk was below the threshold of 1 x 10^{-6}. Potential non-cancer risks were well below the risk threshold of one (Table 5-2). Because the RME exposures for this receptor fell below the established risk thresholds, CTE exposures were not evaluated.

For the construction and utility workers, the potential cancer and non-cancer risks were also evaluated for potential ingestion and dermal contact of surface soils (0 to 0.5 ft depth). The cumulative risks are summarized in the table below.

Receptor	Exposure	Surface Soil - Based	
		Cancer	Non-Cancer
Construction Worker	RME	6.6E-08	1.7E-02
	CTE	NE	NE
Utility Worker	RME	5.7E-09	1.5E-03
	CTE	NE	NE

For the construction worker (Table 5-3a) and utility worker (Table 5-4), the total cancer RME risk was below the threshold of 1 x 10^{-6} for both receptors. The total non-cancer RME risk for each scenario was below a hazard index of one. Because the RME exposures for these receptors fell below the established risk thresholds, CTE exposures were not evaluated.

The potential risks to the construction and utility workers were based on a 100 mg/day soil ingestion rate and a dermal adherence factor for soils of 0.9 mg/cm^2. As alternatives, USEPA suggested that a soil ingestion rate of 330 mg/day (from USEPA, 2001d) and soil dermal adherence factor of 0.2 mg/cm^2 (USEPA, 2004a) be used. Although these would change the risks calculated from the soil ingestion pathway (increase the risk by a factor of 3.3 times) and the risks from the dermal pathway (decrease the risk by a factor of 4.5 times) the total soil cancer and non-cancer risks would still be below the threshold values.

5.1.2 Soil AOC BP, Subsurface Soils (0 to 6 ft)

The construction and utility workers were also evaluated for contact with subsurface soils, representing the depth interval from 0 to 6 ft. The potential cancer risks were evaluated for three chemicals, and the potential non-cancer risks were evaluated for five chemicals. The exposures included soil ingestion, dermal contact, and dust inhalation. The cumulative risks are summarized in the table below:

Receptor	Exposure	Subsurface Soil - Based	
		Cancer	Non-Cancer
Construction Worker	RME	2.4E-07	1.5E-01
	CTE	NE	NE
Utility Worker	RME	6.6E-08	4.9E-02
	CTE	NE	NE

For the construction worker (Table 5-3a) and utility worker (Table 5-4), the total cancer RME risk for each receptor was below the threshold of 1×10^{-6}. The total non-cancer RME risks for both receptors were below a hazard index of one. Because the RME exposures for these receptors fell below the established risk thresholds, CTE exposures were not evaluated, as they would clearly be insignificant.

The potential risks to the construction and utility workers were based on a 100 mg/day soil ingestion rate and a dermal adherence factor for soils of 0.9 mg/cm^2. As alternatives, USEPA suggested that a soil ingestion rate of 330 mg/day (from USEPA, 2001d) and soil dermal adherence factor of 0.2 mg/cm^2 (USEPA, 2004a) be used. Although these would change the risks calculated from the soil ingestion pathway (increase the risk by a factor of 3.3 times) and the risks from the dermal pathway (decrease the risk by a factor of 4.5 times) the total soil cancer and non-cancer risks would still be below the threshold values.

5.1.3 GW AOC 1A

For the RME construction worker scenario (Table 5-3b), potential cancer risks were evaluated for 20 chemicals, and potential non-cancer risks were evaluate for 44 chemicals, for exposure to groundwater from GW AOC 1a. This scenario was based on a dermal contact exposure route. The cumulative risks are summarized in the table below:

Receptor	Exposure	GW - Based	
		Cancer	Non-Cancer
Construction Worker	RME	**2.0E-06**	**3.7E+00**
	CTE	4.6E-07	**1.7E+00**

The potential cancer risk exceeded the 1 x 10^{-6} threshold for the RME case only. The non-cancer risks exceeded the risk threshold of one for both the RME and CTE cases. The cancer and non-cancer risks for individual chemicals are summarized in the table below:

Chemical	Exposure	LNAPL/Impacted Shallow Water-Based	
		Cancer	Non-Cancer
Total PCBs	RME	**2.0E-06**	**4.0E+00**
Total PCBs	CTE	4.0E-07	**2.0E+00**

With the exception of total PCBs, estimated cancer risks for the remaining 19 chemicals were below 1 x 10^{-6}. Similarly, the estimated risks for the remaining 43 chemicals evaluated for potential non-cancer risks were also well below one. The risks attributed to PCBs are associated with the free and residual LNAPL as the soils and groundwater contain little if any PCBs.

5.2 SOIL HOT SPOT 1 (SOIL AOC 1)/SHALLOW GW AOC 1A POTENTIAL RISKS

For Soil AOC 1, potential cancer and non-cancer risks associated with current and future exposures to surface soil were evaluated for a teenager trespasser (Table 5-1) and adult groundskeeper (Table 5-2). Potential risks associated with current and future exposures to surface and subsurface soil were evaluated for an adult construction (Tables 5-3a) and utility worker (Table 5-4). For AOC 1A, potential cancer and non-cancer risks associated with current and future exposures to shallow ground water were evaluated for an adult construction worker (Tables 5-3b).

Detailed risk calculations are provided in the following Annex B tables for the Soil Hot Spot 1 (Soil AOC 1) and shallow groundwater GW AOC 1A:

Pathway	Trespasser	Groundskeeper	Construction Worker	Utility Worker
Soil: Ingestion and dermal contact	B-1	B-5	B-9, B-11	B-28, B-29
Soil: Dust inhalation	B-3	B-7	B-19	B-38
GW: Dermal contact			B-26a, B-26b	

The surface soils (0 to 0.5 ft) were summarized separately from the subsurface soils (0 to 6 ft) since (a) the latter includes the surface soil results in the calculation of the EPCs, and (b) the dust inhalation soil EPCs were based on the subsurface soils only.

5.2.1 Soil Hot Spot 1 (Soil AOC 1) Surface Soils

For the teenage trespasser scenario, potential cancer effects were evaluated for arsenic only, and potential non-cancer risks were evaluated for seven chemicals. The cumulative risks are summarized in the table below:

Receptor	Exposure	Surface Soil - Based	
		Cancer	Non-Cancer
Trespasser	RME	7.8E-08	6.4E-03
	CTE	NE	NE

The total cancer RME risk was below the threshold of 1×10^{-6}. The total non-cancer risk was well below a hazard index of one. Because the RME exposures for this receptor fell below the established risk thresholds, CTE exposures were not evaluated.

For the groundskeeper scenario, potential cancer effects were once again evaluated only for arsenic, and potential non-cancer effects were evaluated for four chemicals. The cumulative cancer and non-cancer risks are summarized in the table below:

Receptor	Exposure	Surface Soil - Based	
		Cancer	Non-Cancer
Groundskeeper	RME	4.9E-07	1.4E-02
	CTE	NE	NE

The cancer RME risk was below the threshold of 1 x 10^{-6}. The total non-cancer RME risk was well below a hazard index of one. Because the RME exposures for this receptor fell below the established risk thresholds, CTE exposures were not evaluated.

For the construction and utility workers, the potential cancer and non-cancer risks were evaluated for potential ingestion and dermal contact of surface soils (0 to 0.5 ft depth). For the construction and utility worker scenarios, potential cancer effects were evaluated for two chemicals (arsenic and total PCBs) and the potential non-cancer risks associated with soil exposures were evaluated for six chemicals. The cumulative risks are summarized in the table below.

Receptor	Exposure	Surface Soil - Based	
		Cancer	Non-Cancer
Construction Worker	RME	5.6E-08	1.4E-02
	CTE	NE	NE
Utility Worker	RME	4.8E-09	1.3E-03
	CTE	NE	NE

The total cancer RME risk for each scenario was below the threshold of 1 x 10^{-6} (Tables 5-3a and 5-4, construction worker and utility worker, respectively). The total non-cancer RME risk for each scenario was below a hazard index of one. Because the RME exposures fell below the established risk thresholds, CTE exposures were not evaluated.

The potential risks to the construction and utility workers were based on a 100 mg/day soil ingestion rate and a dermal adherence factor for soils of 0.9 mg/cm^2. As alternatives, USEPA suggested that a soil ingestion rate of 330 mg/day (from USEPA, 2001d) and soil dermal adherence factor of 0.2 mg/cm^2 (USEPA, 2004a) be used. Although these would change the risks calculated from the soil ingestion pathway (increase the risk by a factor of 3.3 times) and the risks from the dermal pathway (decrease the risk by a factor of 4.5 times) the total soil cancer and non-cancer risks would still be below the threshold values.

5.2.2 Soil Hot Spot 1 (Soil AOC 1) Subsurface Soils

The construction and utility workers were also evaluated for contact with subsurface soils, representing the depth interval from 0 to 6 ft. The potential cancer risks were evaluated for two chemicals, and the potential non-cancer risks were evaluated for six chemicals. The exposure

pathways that were assessed included soil ingestion, dermal contact, and dust inhalation. The cumulative risks are summarized in the table below:

Receptor	Exposure	Subsurface Soil - Based	
		Cancer	Non-Cancer
Construction Worker	RME	1.1E-07	1.7E-01
	CTE	NE	NE
Utility Worker	RME	3.7E-08	5.0E-02
	CTE	NE	NE

The total cancer RME risk for each scenario was below the threshold of 1×10^{-6}. The total non-cancer RME risk for each scenario was below a hazard index of one. Because the RME exposures fell below the established risk thresholds, CTE exposures were not evaluated.

The potential risks to the construction and utility workers were based on a 100 mg/day soil ingestion rate and a dermal adherence factor for soils of 0.9 mg/cm^2. As alternatives, USEPA suggested that a soil ingestion rate of 330 mg/day (from USEPA, 2001d) and soil dermal adherence factor of 0.2 mg/cm^2 (USEPA, 2004a) be used. Although these would change the risks calculated from the soil ingestion pathway (increase the risk by a factor of 3.3 times) and the risks from the dermal pathway (decrease the risk by a factor of 4.5 times) the total soil cancer and non-cancer risks would still be below the threshold values.

5.2.3 GW AOC 1A Groundwater

The calculated risks associated with ground water in AOC 1A were estimated based on the data collected from throughout AOC 1A, the BROS Property, and were presented in Section 5.1.3. Therefore, they are the same for each discrete soil area. Only the PCBs associated with the widespread free and residual LNAPL on and below the water table exceeded the cancer and non-cancer risk thresholds.

5.3 Soil Hot Spot 2 (Soil AOC 6)/Shallow GW AOC 1A Potential Risks

For AOC 6, potential cancer and non-cancer risks associated with current and future exposures to subsurface soil were evaluated for an adult construction and utility worker (Tables 5-3a and 5-4, respectively). For AOC 1A, potential cancer and non-cancer risks associated with current and future exposures to shallow ground water were evaluated for an adult construction worker (Tables 5-3b).

Detailed risk calculations are provided in the following Annex B tables for the Soil Hot Spot 2 (Soil AOC 6) and shallow groundwater GW AOC 1A:

Pathway	Construction Worker	Utility Worker
Soil: Ingestion and dermal contact	B-16	B-35
Soil: Dust inhalation	B-24	B-43
GW: Dermal contact	B-26a, B-26b	

5.3.1 Soil Hot Spot 2 (Soil AOC 6) Subsurface Soils

For the construction and utility worker scenarios, potential cancer effects were evaluated for two chemicals, and potential non-cancer risks were evaluated for three chemicals. The cumulative cancer and non-cancer risks are summarized in the table below:

Receptor	Exposure	Subsurface Soil - Based	
		Cancer	Non-Cancer
Construction Worker	RME	7.4E-08	1.3E-01
	CTE	NE	NE
Utility Worker	RME	3.7E-08	6.5E-02
	CTE	NE	NE

The total cancer RME risk was below the threshold of 1×10^{-6} for both receptors. The total non-cancer RME risks for both receptors were below a hazard index of one (Tables 5-3a and 5-4). Because the RME exposures fell below the established risk thresholds, CTE exposures were not evaluated.

The potential risks to the construction and utility workers were based on a 100 mg/day soil ingestion rate and a dermal adherence factor for soils of 0.9 mg/cm^2. As alternatives, USEPA suggested that a soil ingestion rate of 330 mg/day (from USEPA, 2001d) and soil dermal adherence factor of 0.2 mg/cm^2 (USEPA, 2004a) be used. Although these would change the risks calculated from the soil ingestion pathway (increase the risk by a factor of 3.3 times) and the risks from the dermal pathway (decrease the risk by a factor of 4.5 times) the total soil cancer and non-cancer risks would still be below the threshold values.

5.3.2 GW AOC 1A Groundwater

The calculated risks associated with ground water in AOC 1A were estimated based on the data collected from throughout AOC 1A, the BROS Property, and were presented in Section 5.1.3. Therefore, they are the same for each discrete soil area. Only the PCBs associated with the widespread free and residual LNAPL on and below the water table exceeded the cancer and non-cancer risk thresholds.

5.4 DEBRIS/FILL AREA (SOIL AOC 3)/SHALLOW GW AOC 1A POTENTIAL RISKS

For AOC 3, potential cancer and non-cancer risks associated with current and future exposures to subsurface soil were evaluated for an adult construction and utility worker (Tables 5-3a and 5-4, respectively). For GW AOC 1A, potential cancer and non-cancer risks associated with current and future exposures to shallow ground water were evaluated for an adult construction worker (Tables 5-3b). Risks associated with future exposures to vapors from unsaturated soils (some residual and limited free LNAPL) and shallow ground water were evaluated for an adult worker. The vapor risk estimate results are discussed later in Section 5.10.8

Detailed risk calculations are provided in the following Annex B tables for the Debris/Fill Area (Soil AOC 3) and shallow groundwater GW AOC 1A:

Pathway	Construction Worker	Utility Worker
Soil: Ingestion and dermal contact	B-13	B-32
Soil: Dust inhalation	B-21	B-40
GW: Dermal contact	B-26a, B-26b	

5.4.1 Debris/Fill Area (Soil AOC 3) Subsurface Soils

For the construction and utility worker scenarios, potential cancer and non-cancer effects were evaluated for arsenic only. The cancer and non-cancer risk results are summarized in the table below:

Receptor	Exposure	Subsurface Soil - Based	
		Cancer	Non-Cancer
Construction Worker	RME	8.7E-09	9.6E-04
	CTE	NE	NE
Utility Worker	RME	2.0E-09	3.2E-04
	CTE	NE	NE

The cancer RME risk for arsenic was below the threshold of 1 x 10^{-6} for both receptors. The potential non-cancer RME risk was below a hazard index of one for both scenarios. Because the RME exposures fell below the established risk thresholds, CTE exposures were not evaluated.

The potential risks to the construction and utility workers were based on a 100 mg/day soil ingestion rate and a dermal adherence factor for soils of 0.9 mg/cm^2. As alternatives, USEPA suggested that a soil ingestion rate of 330 mg/day (from USEPA, 2001d) and soil dermal adherence factor of 0.2 mg/cm^2 (USEPA, 2004a) be used. Although these would change the risks calculated from the soil ingestion pathway (increase the risk by a factor of 3.3 times) and the risks from the dermal pathway (decrease the risk by a factor of 4.5 times) the total soil cancer and non-cancer risks would still be below the threshold values.

5.4.2 GW AOC 1A

The calculated risks associated with ground water in AOC 1A were estimated based on the data collected from throughout AOC 1A, the BROS Property, and were presented in Section 5.1.3. Therefore, they are the same for each discrete soil area. Only the PCBs associated with the widespread free and residual LNAPL on and below the water table exceeded the cancer and non-cancer risk thresholds.

5.5 West Side of Property (Soil AOC 5)/Shallow GW AOC 1B Potential Risks

For Soil AOC 5, potential cancer and noncancer risks associated with current and future exposures to surface and subsurface soil were evaluated for an adult construction and utility worker (Tables 5-3a and 5-4, respectively).

With regard to shallow ground water in AOC 1B, potential cancer and noncancer risks associated with future exposures to shallow ground water were evaluated for hypothetical adult and child residents (Tables 5-5 through 5-7a,b). In addition, risks associated with shallow ground water future exposures during agricultural activities were evaluated for an adult and child (Tables 5-8, 5-9a,b).

Detailed risk calculations are provided in the following Annex B tables for the West Side of the BROS Property (Soil AOC 5) and shallow groundwater GW-AOC 1b:

Pathway	Construction Worker	Utility Worker	Recreator - Adult	Recreator - Child
Soil: Ingestion and dermal contact	B-15	B-34	—	—
Soil: Dust inhalation	B-23	B-42	—	—
GW: Ingestion	—	—	B-45a, B-45b	B-46a, B-46b
GW: Inhalation while showering	—	—	B-50	B-54
GW: Dermal contact while showering	—	—	B-52	B-56
GW: Dermal contact during agricultural use	—	—	B-69	B-70

5.5.1 West Side of Property (SOIL AOC 5) – Utility and Construction Workers

Arsenic was the only soil constituent evaluated for the West Side of Property (Soil AOC 5). The cancer and non-cancer risk results are summarized in the table below for both receptors.

Receptor	Exposure	Soil-Based	
		Cancer	Non-Cancer
Construction Worker	RME	6.3E-09	7.7E-04
	CTE	NE	NE
Utility Worker	RME	1.6E-09	2.5E-04
	CTE	NE	NE

The total cancer risks were well below the threshold of 1 x 10^{-6} for both receptors (Table 5-3a, 5-4). The total non-cancer risks were below the HI benchmark of 1.0 for both receptors. Because the RME exposures for West Side of Property (Soil AOC 5) fell below the established risk thresholds, CTE exposures were not evaluated.

800103

The potential risks to the construction and utility workers were based on a 100 mg/day soil ingestion rate and a dermal adherence factor for soils of 0.9 mg/cm^2. As alternatives, USEPA suggested that a soil ingestion rate of 330 mg/day (from USEPA, 2001d) and soil dermal adherence factor of 0.2 mg/cm^2 (USEPA, 2004a) be used. Although these would change the risks calculated from the soil ingestion pathway (increase the risk by a factor of 3.3 times) and the risks from the dermal pathway (decrease the risk by a factor of 4.5 times) the total soil cancer and non-cancer risks would still be below the threshold values.

5.5.2 West Side of Property (GW AOC 1B) – Residential and Agricultural Use

For the residential and agricultural scenarios, no chemicals were evaluated for potential cancer effects. Potential non-cancer effects associated with ground water exposures were evaluated for two chemicals (aluminum and thallium). The cumulative risk results across all chemicals are summarized in the table below.

Receptor	Exposure	Ground Water - Based		
		Ingestion	Showering	Agricultural Use
		Non-Cancer	Non-Cancer	Non-Cancer
Adult	RME	**5.8E+00**	1.0E-02	2.6E-04
	CTE	**3.3E+00**	NE	NE
Child	RME	**1.9E+01**	1.2E-02	4.2E-03
	CTE	**1.1E+01**	NE	NE
Adult + Child	RME	**2.5E+01**	2.2E-02	4.4E-03
	CTE	**1.4E+01**	NE	NE

For the ingestion exposure route, the total hazard quotients exceeded one for all three receptor groups for both the RME and CTE exposures.

For the dermal and inhalation exposure routes during showering, the total RME hazard indices were below the risk threshold of one for the child, adult, and lifetime (child plus adult) receptors. Because the RME exposures for GW AOC 1B fell below the established risk thresholds, CTE exposures were not evaluated.

For the dermal exposure route for the agriculture use of groundwater from GW AOC 1B, the total RME hazard indices were below the risk threshold of one for the child, adult, and lifetime

(child plus adult) receptors. Because the RME exposures for GW AOC 1B fell below the established risk thresholds, CTE exposures were not evaluated.

The table below shows the individual non-cancer risk results for the ingestion exposure route. Since none of the chemicals evaluated for this AOC were VOCs, the inhalation pathway was not relevant for this assessment.

Chemical	Adult Plus Child Non-Cancer Risks	
	RME	CTE
Aluminum	1.1E-02	6.5E-03
Thallium	**2.5E+01**	**1.4E+01**

The non-cancer risks were driven exclusively by the thallium measured in the groundwater from this AOC, although thallium is not known to be a BROS COPC.

5.6 South Side of Property (Soil AOC 4)/GW AOC 1C Potential Risks

For Soil AOC 4, potential cancer and non-cancer risks associated with current and future exposures to surface and subsurface soil were evaluated for an adult construction worker (Table 5-3a). Potential risks associated with only future exposures to surface and subsurface soil were evaluated for an adult utility worker (Table 5-4). For GW AOC 1C, potential cancer and non-cancer risks associated with future shallow ground water exposures during recreational activities were evaluated for an adult and child (Table 5-10 and Table 5-11, respectively). In addition, potential cancer and non-cancer risks associated with current and future shallow ground water exposures were evaluated for an adult construction worker (Table 5-3b).

Detailed risk calculations are provided in the following Annex B tables:

Pathway	Construction Worker	Utility Worker	Recreator - Adult	Recreator - Child
Soil: Ingestion and dermal contact	B-14	B-33	—	—
Soil: Dust inhalation	B-22	B-41	—	—
GW: Ingestion (water fountain)	—	—	B-81	B-82
GW: Dermal contact	B-27	—	—	—

5.6.1 South Side of Property (Soil AOC 4)

For the construction and utility worker scenarios, potential cancer risks were evaluated for arsenic only (Tables 5-3a and 5-4, respectively). The cumulative risk results are summarized in the table below:

Receptor	Exposure	Soil-Based	
		Cancer	Non-Cancer
Construction Worker	RME	5.2E-09	5.7E-04
	CTE	NE	NE
Utility Worker	RME	1.2E-09	1.9E-04
	CTE	NE	NE

The cancer RME risks from arsenic were below the threshold of 1 x 10^{-6} for both receptors. Potential non-cancer RME risks associated with soil exposures were below a non-cancer risk threshold of one for both receptors.

Because the RME exposures fell below the established risk thresholds, CTE exposures were not evaluated for these receptors.

The potential risks to the construction and utility workers were based on a 100 mg/day soil ingestion rate and a dermal adherence factor for soils of 0.9 mg/cm^2. As alternatives, USEPA suggested that a soil ingestion rate of 330 mg/day (from USEPA, 2001d) and soil dermal adherence factor of 0.2 mg/cm^2 (USEPA, 2004a) be used. Although these would change the risks calculated from the soil ingestion pathway (increase the risk by a factor of 3.3 times) and the risks from the dermal pathway (decrease the risk by a factor of 4.5 times) the total soil cancer and non-cancer risks would still be below the threshold values.

5.6.2 South Side of Property (GW AOC 1C)

Receptor: Construction Worker

For the construction worker , potential cancer and non-cancer risks from dermal exposure to GW AOC 1C were evaluated for arsenic only. The cancer and non-cancer risks are summarized in the table below.

Receptor	Exposure	Soil-Based	
		Cancer	Non-Cancer
Construction Worker	RME	1.1E-10	1.8E-05
	CTE	NE	NE

The potential cancer RME risk for arsenic was below the threshold of 1 x 10^{-6}. Potential non-cancer RME risk associated with ground water exposures was below a hazard index of one. Because the RME exposures to GW AOC 1C fell below the established risk thresholds, CTE exposures were not evaluated.

Receptor: Adult and Child Recreator

For the recreational scenario, potential cancer and non-cancer risks from ingestion of groundwater from GW AOC 1C were evaluated for arsenic only. The risk results are summarized in the table below.

Receptor	Exposure	Ground Water - Based	
		Cancer	Non-Cancer
Adult	RME	2.9E-07	2.0E-03
	CTE	NE	NE
Child	RME	2.1E-07	5.7E-03
	CTE	NE	NE
Adult + Child	RME	5.0E-07	7.7E-03
	CTE	NE	NE

The cancer RME risk was below the threshold of 1 x 10^{-6} for the child, adult, and lifetime (adult plus child) receptors (Tables 5-10, 5-11 and 5-12a). Potential non-cancer RME risks associated with ground water exposures were below a hazard index of one for the child, adult, and lifetime (adult plus child) receptors (Tables 5-10, 5-11 and 5-12a)..

Because the RME exposures to GW AOC 1C fell below the established risk thresholds, CTE exposures were not evaluated.

5.7 DRAINAGE SWALE (SOIL AOC 2)/GW AOC 1D POTENTIAL RISKS

For Soil AOC 2, potential cancer and non-cancer risks associated with current and future exposures to surface and subsurface soil were evaluated for an adult construction and utility worker (Tables 5-3a and 5-4, respectively). As previously noted in the exposure assessment, contact with shallow ground water was not assessed for these two receptors since the average depth to the shallow groundwater is approximately 8 to 9 ft BGS at GW AOC 1d, which is too deep for any activities by these receptor groups.

Detailed risk calculations are provided in the following Annex B tables:

Pathway	Construction Worker	Utility Worker
Soil: Ingestion and dermal contact	B-10, B-12	B-30, B-31
Soil: Dust inhalation	B-20	B-39

As stated with the other Soil AOCs, the surface soils (0 to 0.5 ft) were summarized separately from the subsurface soils (0 to 6 ft) since (a) the latter includes the surface soil results in the calculation of the EPCs, and (b) the dust inhalation soil EPCs were based on the subsurface soils only. Consequently the surface soil exposure pathways only examined the dermal contact and soil ingestion exposure pathways.

5.7.1 Drainage Swale (Soil AOC 2), Surface Soil Exposure

For the construction and utility worker scenarios, potential cancer and non-cancer effects associated with soil exposures were evaluated for three chemicals. The cumulative risk results across all chemicals are summarized in the table below for the surface soils (0 to 0.5 ft) exposure.

Receptor	Exposure	LNAPL/Shallow Ground Water - Based		Surface Soils (0 to 0.5 ft)-Based		Combined	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Construction Worker	RME	NE	NE	6.8E-08	2.4E-02	6.8E-08	2.4E-02
	CTE	NE	NE	NE	NE	NE	NE
Utility Worker	RME	NE	NE	3.5E-08	2.8E-02	3.5E-08	2.8E-02
	CTE	NE	NE	NE	NE	NE	NE

The total cancer RME risk was below the threshold of 1 x 10^{-6}, and the total non-cancer RME risk for soil exposure was below a hazard index of one for both evaluated receptors. Because the RME exposures for Soil AOC 2 fell below the established risk thresholds, CTE exposures were not evaluated.

5.7.2 Drainage Swale (Soil AOC 2), Subsurface Soil Exposure

For the construction and utility worker scenarios, potential cancer and non-cancer risks associated with soil exposures were evaluated for three chemicals. The cumulative risk results across all chemicals are summarized in the table below for the surface soils (0 to 6 ft) exposure.

Receptor	Exposure	LNAPL/Shallow Ground Water - Based		Subsurface Soil (0 to 6 ft) - Based		Combined	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Construction Worker	RME	NE	NE	3.5E-08	2.8E-02	3.5E-08	2.8E-02
	CTE	NE	NE	NE	NE	NE	NE
Utility Worker	RME	NE	NE	1.3E-08	1.3E-02	1.3E-08	1.3E-02
	CTE	NE	NE	NE	NE	NE	NE

The total cancer RME risk was below the threshold of 1 x 10^{-6}, and the total non-cancer RME risk for soil exposure was below a hazard index of one, for both evaluated receptors (Tables 5-3a and 5-4). Because the RME exposures for Soil AOC 2 fell below the established risk thresholds, CTE exposures were not evaluated.

5.8 POTENTIAL RISKS FROM EXPOSURE TO VOLATILIZED CHEMICALS

In this section the potential risks associated with the different inhalation pathways presented in the Exposure Assessment (Section 3.5.1) are summarized. Values in bold exceeded their respective risk thresholds. The term "ND" in these tables indicates that the chemical was not detected or not detected at a frequency greater than or equal to 5%. The term "NA" indicates that this chemical was not assessed either due to the lack of relevance of the toxicity endpoint, or lack of relevant physico-chemical constants or toxicity data.

5.8.1 Potential Future-Use Scenario, Soil Hot Spot 2 On-Property Indoor Air Exposure Pathway

For this future-use exposure scenario, the potential cancer and non-cancer risks associated with worker exposure within a 1,000-ft^2 building located in the vicinity of Soil Hot Spot 2 (Soil AOC 6) on the BROS property were evaluated. Current levels of VOCs, SVOCs and PCBs detected in the shallow ground water and soils on the BROS property were used for this assessment. As such, any potential risks are conservative since they would not reflect the decline in concentrations from any remediation activities. The ground water and soil results that were used as inputs for this evaluation are summarized in Tables A-4 and A-5 (of Annex A), respectively. Using the J&E model, potential cancer and non-cancer risks were calculated based on the 95% UCLs of the mean soil and shallow ground water concentrations, the model assumptions presented in Table 3-5, and receptor exposure assumptions presented in Table 3-2. Tables A-14a and A-14b (Annex A) present a summary of the results for the CTE and RME exposure assumptions, respectively. The cumulative results across all chemicals are summarized in the table below.

	LNAPL/Shallow Ground Water -Based		Soil-Based		Combined	
Exposure	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
RME	**7.6E-06**	3.5E-02	**4.8E-06**	**1.6E+01**	**1.2E-05**	**1.7E+01**
CTE	**1.3E-06**	2.1E-02	**8.0E-07**	**2.6E+01**	**2.1E-06**	**2.6E+01**

The risks for those chemicals that exceed threshold values for one or more environmental media are summarized in the table below:

		LNAPL/Shallow Ground Water - Based		Soil-Based		Combined	
Chemical	Exposure	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Total PCBs	RME	**1.2E-06**	NA	**4.8E-06**	NA	**5.9E-06**	NA
Benzene	RME	**4.6E-06**	NA	ND	ND	**4.6E-06**	ND
Vinyl chloride	RME	**1.5E-06**	4.8E-03	ND	ND	**1.5E-06**	4.8E-03
Naphthalene	RME	NA	1.9E-03	NA	**4.1E+00**	NA	**4.2E+00**
Phenanthrene	RME	NA	4.7E-03	NA	**2.0E+00**	NA	**2.0E+00**
Xylenes (Total)	RME	NA	2.0E-02	NA	**9.7E+00**	NA	**9.7E+00**
Naphthalene	CTE	NA	1.1E-03	NA	**2.9E+00**	NA	**2.9E+00**
Phenanthrene	CTE	NA	2.8E-03	NA	**1.4E+00**	NA	**1.4E+00**

Chemical	Exposure	LNAPL/Shallow Ground Water - Based		Soil-Based		Combined	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Xylenes (Total)	CTE	NA	1.2E-02	NA	**2.1E+01**	NA	**2.1E+01**

RME Exposures

Potential cancer effects were evaluated for 14 chemicals, and potential risks were greater than 1 x 10^{-6} for three chemicals (total PCBs, benzene, and vinyl chloride). The potential non-cancer effects were evaluated for 20 chemicals. Potential non-cancer risks exceeded 1 for three chemicals (naphthalene, phenanthrene and total xylenes).

The relative contribution from soil or shallow ground water to the total chemical-specific risk was evaluated. For the three chemicals that yielded potential cancer risks above the 1 x 10^{-6} threshold, the majority of the total PCB risk (80%) was derived from the soil concentration, associated with residual LNAPL. Benzene and vinyl chloride were not detected in the soil samples. For the three non-cancer chemicals that were above the threshold of 1, greater than 99% of the combined risk was derived from the soil concentrations.

CTE Exposure

Potential cancer effects were evaluated for 14 chemicals, and none exceeded the cancer risk benchmark of 1 x 10^{-6}. The potential non-cancer effects were evaluated for 20 chemicals, and three chemicals (naphthalene, phenanthrene and total xylenes) yielded potential non-cancer hazard indices greater than 1. Total xylenes contributed the most (80%) to the total non-cancer risk.

The relative contributions to the total risk from soil or shallow ground water sources were evaluated. For the three non-cancer chemicals that were above the threshold of 1, greater than 99% of the combined risk for each chemical was derived from the soil concentrations.

In evaluating the results of this hypothetical future use scenario, it is important to note the highly conservative and precautionary nature of the assessment that was performed. For example, the EPC values for the chemicals identified with cancer risks greater than 1 x 10^{-6}, were the maximum values observed in the soils, from samples largely biased to soil strata with elevated COPCs. Therefore, these risks are likely to be biased high.

Summary: Based on this evaluation, several of the COPCs detected in the soil and shallow ground water impacted by soil resulted in potential cancer or non-cancer risks above threshold values for this exposure scenario under the assumptions that were used. There were no potential cancer risks above the 1 x 10^{-6} threshold for the CTE exposure. For the RME exposure scenario, three COPCs exceeded the risk threshold of 1 x 10^{-6}. Three potential non-cancer COPCs exceeded the risk threshold of one for both the RME and CTE exposure scenarios. Total xylenes dominated the potential non-cancer risks. The contributions of the different media to the total risk were chemical-specific.

5.8.2 Potential Future-Use Scenario, Potential Future-Use Scenario, Soil Hot Spot 1 On-Property Indoor Air Exposure Pathway

For this future-use exposure scenario, the potential cancer and non-cancer risks associated with worker exposure within a 1,000-ft^2 building located in the vicinity of Soil Hot Spot 1 (Soil AOC 1) on the BROS property were evaluated. The shallow ground water (with associated LNAPL around the water table) and soil results (a total of 38 chemicals) that were used as inputs for this evaluation are summarized in Tables A-6 and A-7 (Annex A), respectively. The J&E model was used to calculate the potential cancer and non-cancer risks, based on the 95% UCLs of the mean soil and shallow ground water concentrations, the model assumptions presented in Table 3-5, and receptor exposure assumptions presented in Table 3-2. Tables A-15a and A-15b (Annex A) present the results for the CTE and RME exposure assumptions, respectively. The cumulative results across all chemicals are summarized in the table below.

Exposure	LNAPL/Shallow Ground Water -Based		Soil-Based		Combined	
	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
RME	**2.95E-03**	**2.47E+01**	**4.77E-06**	**2.88E+01**	**2.95E-03**	**5.35E+01**
CTE	**4.95E-04**	**1.48E+01**	**8.02E-07**	**2.07E+01**	**4.96E-04**	**3.55E+01**

The risks for those chemicals that exceed threshold values are summarized in the table below on the next page.

Chemical	Exposure	LNAPL/Shallow Ground Water -Based		Soil-Based		Combined	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
1,2-Dichloroethane	RME	**1.1E-05**	NA	ND	ND	**1.1E-05**	NA
Total PCBs	RME	ND	ND	**4.8E-06**	NA	**4.8E-06**	NA
Benzene	RME	**1.6E-04**	NA	ND	ND	**1.6E-04**	NA

Chemical	Exposure	LNAPL/Shallow Ground Water -Based		Soil-Based		Combined	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Chloroform	RME	**4.2E-05**	NA	ND	ND	**4.2E-05**	NA
Trichloroethene	RME	**2.4E-03**	**1.5E+00**	ND	ND	**2.4E-03**	**1.5E+00**
Vinyl chloride	RME	**3.6E-04**	**1.1E+00**	ND	ND	**3.6E-04**	**1.1E+00**
cis-1,2-Dichloroethene	RME	NA	**1.9E+01**	ND	ND	NA	**1.9E+01**
Naphthalene	RME	NA	7.7E-02	NA	**1.9E+01**	NA	**1.9E+01**
Phenanthrene	RME	NA	1.4E-03	NA	**7.3E+00**	NA	**7.3E+00**
Phenol	RME	ND	ND	NA	**1.1E+00**	NA	**1.1E+00**
Xylenes (Total)	RME	NA	**1.8E+00**	ND	ND	NA	**1.8E+00**
1,2-Dichloroethane	CTE	**1.9E-06**	NA	ND	ND	**1.9E-06**	NA
Benzene	CTE	**2.7E-05**	NA	ND	ND	**2.7E-05**	NA
Chloroform	CTE	**7.0E-06**	NA	ND	ND	**7.0E-06**	NA
Trichloroethene	CTE	**4.0E-04**	9.1E-01	ND	ND	**4.0E-04**	9.1E-01
Vinyl chloride	CTE	**6.1E-05**	6.9E-01	ND	ND	**6.1E-05**	6.9E-01
cis-1,2-Dichloroethene	CTE	NA	**1.2E+01**	ND	ND	NA	**1.2E+01**
Naphthalene	CTE	NA	4.6E-02	NA	**1.3E+01**	NA	**1.4E+01**
Phenanthrene	CTE	NA	8.4E-04	NA	**5.1E+00**	NA	**5.1E+00**
Xylenes (Total)	CTE	NA	**1.1E+00**	ND	ND	NA	**1.1E+00**

RME Exposure

Potential cancer effects were evaluated for 16 chemicals in this hypothetical future use scenario and the 1 x 10^{-6} risk level was exceeded for six substances (1,2-Dichloroethane, total PCBs, benzene, chloroform, TCE, and vinyl chloride). About 92% of the total calculated cancer risk was contributed by the combination of TCE and vinyl chloride. The potential non-cancer effects were evaluated for 24 chemicals, and seven chemicals (TCE, vinyl chloride, cis-1,2-Dichloroethene, naphthalene, phenanthrene, phenol, total xylenes) were associated with potential non-cancer risks greater than 1. Combining the cis-1,2-Dichloroethene and naphthalene risks represented about 73% of the total calculated non-cancer risk.

Total RME cancer and non-cancer risks were highest for Hot Spot 1 compared with any of the other soil and ground water vapor modeling scenarios.

The relative contribution of soil or shallow ground water (and associated LNAPL) sources to the total risk estimate was evaluated. For the seven chemicals that yielded potential cancer risks above the 1 x 10^{-6} threshold, all of the risks were derived from the shallow ground water (and associated LNAPL) concentrations, with total PCBs being the only exception (total PCBs were not detected in ground water). For the seven non-cancer chemicals that were above the threshold of 1, greater than 99% of the risks from naphthalene, phenanthrene and phenol were

derived from the soil concentrations. The remaining chemicals were not detected in the soil samples from this area.

CTE Exposure

Potential cancer effects were evaluated for 16 chemicals, and five (1,2-Dichloroethane, benzene, chloroform, TCE, and vinyl chloride) were associated with potential risks greater than 1×10^{-6}. Combined, the TCE and vinyl chloride risks contributed about 92% of the total calculated cancer risk. The potential non-cancer effects were evaluated for 24 chemicals, and four chemicals (cis-1,2-Dichloroethene, naphthalene, phenanthrene, and total xylenes) were associated with potential non-cancer hazard indices greater than 1. Combining the cis-1,2-Dichloroethene and naphthalene risks represented about 71% of the total calculated non-cancer risk.

The relative contribution of soil or shallow ground water (and associated LNAPL) sources to the total risk estimate was evaluated. For the five chemicals that exceeded the 1×10^{-6} threshold for potential cancer risks in this hypothetical scenario, all of the risks were derived from ground water. For the four non-cancer chemicals that were above the threshold of 1, greater than 99% of the risks from naphthalene and phenanthrene were derived from the soil concentrations. The remaining two chemicals were not detected in the soil samples from this area.

Summary: Based on this precautionary evaluation of a hypothetical future use scenario, several of the COPCs detected in the shallow ground water (and associated LNAPL) and soil resulted in potential cancer or non-cancer risks above threshold values under the assumptions that were used. For the CTE and RME exposure scenarios, five and six of the potential cancer COPCs (respectively) exceeded the risk threshold of 1×10^{-6}. The principal cancer risk drivers were TCE and vinyl chloride. Four COPCs were above the risk threshold of one for potential non-cancer risk under the CTE, while seven COPCs exceeded this benchmark under the RME analysis. The non-cancer risk drivers were cis-1,2-Dichloroethene and naphthalene. The contributions of the different media to the total risk were chemical-specific.

5.8.3 Potential Future-Use Scenario, Potential Future-Use Scenario, West Side Property, Off-Property Indoor Air Exposure Pathway

For this future-use exposure scenario, the potential cancer and non-cancer risks associated with worker exposure within a 1,000-ft^2 building located on the West Side Property proximal to the BROS property line were evaluated. The shallow ground water and soil results that were used

as inputs for this evaluation (total of 28 chemicals) are summarized in Tables A-8 and A-9 (Annex A), respectively. The J&E model was used to calculate hypothetical potential cancer and non-cancer risks, based on the 95% UCLs of the mean soil and shallow ground water concentrations, the model assumptions presented in Table 3-5, and receptor exposure assumptions presented in Table 3-2. Tables A-16a and A-16b (Annex A) present a summary of the results for the CTE and RME exposure assumptions, respectively. The cumulative results across all chemicals are summarized in the table below.

	LNAPL/Shallow Ground Water -Based		Soil-Based		Combined	
Exposure	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
RME	**2.0E-05**	4.6E-02	5.0E-08	2.7E-04	**2.0E-05**	4.7E-02
CTE	**3.4E-06**	2.8E-02	8.4E-09	5.7E-04	**3.4E-06**	2.8E-02

The risks for those chemicals that exceeded threshold values are summarized in the table below.

		LNAPL/Shallow Ground Water - Based		Soil-Based		Combined	
Chemical	Exposure	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Total PCBs	RME	**1.2E-06**	NA	5.0E-08	NA	**1.2E-06**	NA
Benzene	RME	**4.6E-06**	NA	ND	ND	**4.6E-06**	ND
Trichloroethene	RME	**1.2E-05**	7.7E-03	ND	ND	**1.2E-05**	7.7E-03
Vinyl chloride	RME	**1.5E-06**	4.8E-03	ND	ND	**1.5E-06**	4.8E-03
Trichloroethene	CTE	**2.0E-06**	4.6E-03	ND	ND	**2.0E-06**	4.6E-03

RME Exposure

Potential cancer effects were evaluated for 9 chemicals, and four (total PCBs, benzene, TCE, and vinyl chloride) were associated with potential risks greater than 1×10^{-6}. TCE contributed about 60% of the total cancer risk, followed by benzene (23%). The potential non-cancer effects were evaluated for 21 chemicals, and none were shown to have hypothetical non-cancer potential risks greater than 1.

CTE Exposure

Potential cancer effects were evaluated for 9 chemicals, and only TCE was associated with potential risks at or greater than 1 x 10^{-6}. The potential non-cancer effects were evaluated for 21 chemicals, and none produced potential non-cancer risks greater than 1.

With regard to the relative contribution of soil or shallow ground water sources to total chemical-specific risks, only ground water was associated with potential cancer risks above the 1 x 10^{-6} threshold in this hypothetical scenario.

The relative contribution of soil or shallow ground water sources to the total risk estimates were evaluated. All chemicals associated with a calculated potential cancer risk estimate above the 1 x 10^{-6} threshold were attributable to the ground water concentrations.

Summary: Based on this evaluation, several of the COPCs detected in the soil and shallow ground water impacted by soil resulted in potential cancer risks above threshold values for this hypothetical exposure scenario under the highly precautionary assumptions that were used. For the CTE and RME exposure scenarios, one and four (respectively) of the COPCs exceeded the risk threshold of 1 x 10^{-6}. There were no potential non-cancer risks above threshold value for this exposure pathway. The principal cancer risk drivers were TCE and benzene. All of the potential cancer risk was derived from the shallow ground water concentrations.

5.8.4 Potential Future-Use Scenario, Potential Future-Use Scenario, South Side Property, Off-Property Indoor Air Exposure Pathway

For this future-use exposure scenario, the potential cancer and non-cancer risks associated with worker exposure within a 1,000-ft^2 building located on the South Side Property proximal to the BROS property line was evaluated. The shallow ground water and soil results that were used as inputs for this evaluation (total of 11 chemicals) are summarized in Tables A-10 and A-11 (Annex A), respectively. The potential cancer and non-cancer risks were calculated using the J&E model based on the 95% UCLs of the mean soil and shallow ground water concentrations, the model assumptions presented in Table 3-5, and receptor exposure assumptions presented in Table 3-2. Tables A-17a and A-17b (Annex A) summarize the results for the CTE and RME exposure assumptions, respectively. The cumulative results across all chemicals are summarized in the table below.

Exposure	LNAPL/Shallow Ground Water - Based		Soil-Based		Combined	
	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
RME	**1.1E-05**	8.5E-03	2.0E-08	1.8E-07	**1.1E-05**	8.5E-03
CTE	**1.8E-06**	5.1E-03	6.6E-09	1.1E-07	**1.8E-06**	5.1E-03

The risks for those chemicals that exceeded threshold values are summarized in the table below.

Chemical	Exposure	Shallow Ground Water -Based		Soil-Based		Combined	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
bis(2-Chloroethyl)ether	RME	**9.2E-06**	NA	ND	ND	**9.2E-06**	NA
bis(2-Chloroethyl)ether	CTE	**1.5E-06**	NA	ND	ND	**1.5E-06**	NA

RME Exposure

Potential cancer effects were evaluated for five chemicals, and a potential risk greater than 1 x 10^{-6} was only associated with BCEE. The potential non-cancer effects were evaluated for six chemicals, and all hazard quotients were less than 1. Similar to the CTE analysis, this indicates that there are no potential non-cancer risks associated with this exposure scenario.

CTE Exposure

Potential cancer effects were evaluated for five chemicals, and a potential risk greater than 1 x 10^{-6} was only associated with one chemical [bis(2-chloroethyl)ether]. The potential non-cancer effects were evaluated for six chemicals, and all hazard quotients were less than 1, indicative of no risk, even under the protective assumptions used in this analysis.

The relative contributions to the total risk from soils or ground water sources were evaluated. For the single chemical (BCEE) associated with potential cancer risks above the 1 x 10^{-6} threshold, all of the risk was derived from the shallow ground water concentration. Since BCEE was detected in only one sample, these risks may be considered biased high.

Summary: Based on this conservative evaluation, only one of the COPCs detected in the shallow ground water and soil resulted in potential cancer risks above threshold values for this exposure scenario under the assumptions that were used. There were no potential non-cancer risks above the threshold value for this exposure pathway. The chemical bis(2-chloroethyl)ether

(BCEE), which was detected in only one shallow ground water sample, was associated with a potential cancer risk above the threshold.

5.8.5 Potential Future-Use Scenario, Potential Future-Use Scenario, Remaining BROS Property (Excluding Former Lagoon Area), On-Property Indoor Air Exposure Pathway

For this future-use exposure scenario, the potential cancer and non-cancer risks associated with worker exposure within a 1,000-ft^2 building located at locations not previously evaluated on the BROS property and excluding well MW-26S (which represents the water table ground water quality for the former lagoon area) was evaluated. The shallow ground water and soil results that were used as inputs for this evaluation (total of 41 chemicals) are summarized in Tables A-12A and A-13 (Annex A), respectively. The potential cancer and noncancer risks were calculated using the J&E model based on the 95% UCLs of the mean soil and shallow ground water concentrations, the model assumptions presented in Table 3-5, and receptor exposure assumptions presented in Table 3-2. Tables A-18a and A-18b (Annex A) present the results for the CTE and RME exposure assumptions, respectively. The cumulative results across all chemicals are summarized in the table below.

	LNAPL/Shallow Ground Water -Based		Soil-Based		Combined	
Exposure	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
RME	**7.7E-06**	2.0E-01	1.2E-05	**3.3E+00**	**2.0E-05**	**3.5E+00**
CTE	**1.3E-06**	1.2E-01	5.3E-06	**2.5E+00**	**6.6E-06**	**2.6E+00**

The risks for those chemicals that exceeded threshold values are summarized in the table below.

		LNAPL/Shallow Ground Water-Based		Soil-Based		Combined	
Chemical	Exposure	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Total PCBs	RME	4.2E-08	NA	**4.8E-06**	NA	**4.8E-06**	NA
Benzene	RME	**6.5E-06**	NA	4.8E-07	NA	**7.0E-06**	NA
bis(2-Chloroethyl)ether	RME	**1.0E-06**	NA	ND	ND	**1.0E-06**	ND
Trichloroethene	RME	ND	ND	**6.8E-06**	4.3E-03	**6.8E-06**	4.3E-03
Phenanthrene	RME	ND	ND	NA	**2.6E+00**	ND	**2.6E+00**
Benzene	CTE	**1.1E-06**	NA	2.9E-07	NA	**1.4E-06**	NA
Trichloroethene	CTE	ND	ND	**4.1E-06**	9.3E-03	**4.1E-06**	9.3E-03
Phenanthrene	CTE	ND	ND	NA	**1.8E+00**	ND	**1.8E+00**

RME Exposure

Potential cancer effects were evaluated for 14 chemicals, and four (Total PCBs, benzene, BCEE, and TCE) were associated with a potential risk greater than 1×10^{-6}. The cancer risk result for BCEE was only slightly above the risk threshold of 1×10^{-6}. About 69% of the total cancer risk was attributable to benzene and TCE. The potential non-cancer effects were evaluated for 24 chemicals, and one (phenanthrene) yielded a potential non-cancer risk greater than 1.

The relative contributions to the total risk from soils or shallow ground water (and associated LNAPL where present) sources were evaluated. For all potential cancer compounds except for total PCBs and TCE, shallow ground water was the primary source of chemical exposure. All of the non-cancer risk from phenanthrene was due to the presence of this chemical in soils.

CTE Exposure

Potential cancer effects were evaluated for 14 chemicals, and two (benzene and TCE) yielded a potential risk greater than 1×10^{-6}. The potential non-cancer effects were evaluated for 24 chemicals, and one (phenanthrene) yielded a potential non-cancer risk greater than 1.

The relative contributions to the total risk from soils or shallow ground water sources were evaluated. For benzene, 79% of the total risk was attributable to the shallow ground water concentration, while 100% of the risk from TCE was derived from soils (this chemical was not detected in the ground water under this scenario). All of the non-cancer risk from phenanthrene was due to the presence of this chemical in soils.

Summary: Based on this evaluation, several of the COPCs detected in the soil and shallow ground water impacted by soil resulted in potential cancer risks above threshold values for this exposure scenario under the highly precautionary assumptions that were used. Two and four of the COPCs had potential cancer chemicals exceeding the risk threshold of 1×10^{-6} for the CTE and RME exposures (respectively), while only one non-cancer chemical exceeded the threshold of one. Most of the cancer risk was attributable to shallow ground water concentrations of these chemicals with the exception of total PCBs and TCE. For the single non-carcinogen that exceeded the risk threshold (phenanthrene), all of the predicted risk was due to the presence of the chemical in soils.

5.8.6 Potential Future-Use Scenario, Potential Future-Use Scenario, Remaining BROS Property Former Lagoon Area, On-Property Indoor Air Exposure Pathway

For this future-use exposure scenario, the potential cancer and non-cancer risks associated with worker exposure within a 1,000-ft^2 building located near well MW-26S (which represents the water table ground water quality for the former lagoon area) was evaluated. The shallow ground water results that were used as inputs for this evaluation (total of 24 chemicals) are summarized in Tables A-12B (Annex A), respectively. Soils were not evaluated in this scenario since none fell within the 0-6 feet depth interval assessed for this subarea. The potential cancer and non-cancer risks were calculated using the J&E model based on the 95% UCLs of the mean shallow ground water concentrations, the model assumptions presented in Table 3-5, and receptor exposure assumptions presented in Table 3-2. Tables A-19a and A-19b (Annex A) present the results for the CTE and RME exposure assumptions, respectively. The cumulative results across all chemicals are summarized in the table below.

	LNAPL/Shallow Ground Water - Based		Soil-Based		Combined	
Exposure	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
RME	**2.4E-03**	**3.0E+00**	---	---	**2.4E-03**	**3.0E+00**
CTE	**4.1E-04**	**1.8E+00**	---	---	**4.1E-04**	**1.8E+00**

The risks for those chemicals that exceeded threshold values are summarized in the table below:

		LNAPL/Shallow Ground Water -Based	
Chemical	Exposure	Cancer	Non-Cancer
1,2-Dichloroethane	RME	**1.8E-05**	NA
1,2-Dichloropropane	RME	**1.9E-06**	6.9E-02
Benzene	RME	**7.1E-05**	NA
bis(2-Chloroethyl)ether	RME	**4.8E-05**	NA
Chloroethane	RME	**8.7E-06**	2.9E-03
Chloroform	RME	**8.4E-06**	NA
Methylene chloride	RME	**1.6E-06**	3.2E-03
Tetrachloroethene	RME	5.8E-06	NA
Trichloroethene	RME	**2.2E-03**	**1.4E+00**
Vinyl chloride	RME	**3.9E-05**	1.2E-01
1,2-Dichloroethane	CTE	**3.0E-06**	3.0E-06
Benzene	CTE	**1.2E-05**	1.2E-05
bis(2-Chloroethyl)ether	CTE	**8.0E-06**	8.0E-06

		LNAPL/Shallow Ground Water -Based	
Chemical	Exposure	Cancer	Non- Cancer
Chloroethane	CTE	**1.5E-06**	1.5E-06
Chloroform	CTE	**1.4E-06**	1.4E-06
Trichloroethene	CTE	**3.7E-04**	3.7E-04
Vinyl chloride	CTE	**6.6E-06**	6.6E-06

RME Exposure

Potential cancer effects were evaluated for 16 chemicals, and ten (1,2-Dichloroethane, 1,2-Dichloropropane, benzene, BCEE, chloroethane, chloroform, methylene chloride, PCE, TCE, and vinyl chloride) were associated with a potential risk greater than 1 x 10^{-6}. . As with the CTE exposure, about 92% of the total cancer risk was attributable to trichloroethene. The potential non-cancer effects were evaluated for 30 chemicals, and one (TCE) yielded a potential non-cancer risk greater than 1.

CTE Exposure

Potential cancer effects were evaluated for 16 chemicals, and seven (1,2-Dichloroethane, benzene, BCEE, chloroethane, chloroform, TCE and vinyl chloride) yielded a potential risk greater than 1 x 10^{-6}. About 92% of the total cancer risk was attributable to trichloroethene. The potential non-cancer effects were evaluated for 30 chemicals, and none yielded a potential non-cancer risk greater than 1.

Summary: Based on this evaluation, several of the COPCs detected in the shallow ground water resulted in potential cancer risks above threshold values for this exposure scenario under the highly precautionary assumptions that were used. Seven and 16 of the COPCs had potential cancer chemicals exceeding the risk threshold of 1 x 10^{-6} for the CTE and RME exposures (respectively), while one of these chemicals (TCE) also exceeded the non-cancer risk threshold of one, but only under the RME exposure case.

5.8.7 Risk-Driving Chemicals for the Vapor Intrusion Pathway

Across all of the evaluated areas, risk from benzene exposure was most frequently (5/6) above the cancer risk threshold, followed by total PCBs, TCE and vinyl chloride (all at 4/6) (Table 5-13). For the non-cancer risks, phenanthrene was most frequently (3/8) above the non-cancer risk threshold, followed by naphthalene, TCE and total xylenes (2/8).

Within a given exposure scenario, the largest number of cancer risks calculated above the risk threshold of $1x10^{-6}$ was for the former lagoon area (9), followed by Soil Hot Spot 1 (6). The remaining scenarios ranged from 0 to 4 cancer chemicals above the risk threshold.

For the non-cancer compounds, the largest number of non-cancer risks calculated above the risk threshold of 1 was from Soil Hot Spot 1 (7). The remaining scenarios ranged from 0 to 3 non-cancer chemicals above the risk threshold.

5.9 DEEP GROUND WATER AOC 3 (BELOW 40' OF GROUND SURFACE ON AND ADJACENT TO BROS PROPERTY) POTENTIAL RISKS

In the analysis of Deep Ground water (AOC 3) risks, potential cancer and non-cancer risks associated with hypothetical future exposures to deep ground water during recreational activities (associated with the consumption of ground water from a hypothetical fountain that accesses ground water from AOC 3) were evaluated for an adult and child. Potential risks were also combined to represent a lifetime exposure since childhood (shown as "Adult + Child" in the tables below). This exposure scenario is highly unlikely given the existing deed restriction and other institutional controls that preclude such uses as well as the state ownership of the Property.

Detailed risk calculations are provided in the following Annex B tables:

Pathway	Adult	Child
GW: Ingestion	B-83a, B-83b	B-84a, B-84b

For the adult and child who might ingest water from a fountain during recreational activities, potential cancer effects were evaluated for 15 chemicals. Potential non-cancer effects were evaluated for 41 chemicals. The cumulative risk results across all chemicals are summarized in the table below for both of these receptors:

Receptor	Exposure	Ground Water - Based	
		Cancer	Non-Cancer
Adult	RME	**1.0E-04**	**1.5E+00**
	CTE	**3.0E-05**	4.1E-01
Child	RME	**7.5E-05**	**4.1E+00**
	CTE	**2.2E-05**	**1.2E+00**
Adult + Child	RME	**1.8E-04**	**5.6E+00**
	CTE	**5.1E-05**	**1.6E+00**

Chemicals exceeding their RME or CTE cancer and non-cancer risk benchmark(s) are shown in bold in the table below, for adults, children, and lifetime (adult plus child) exposure:

Chemical	Exposure	Ground Water - Based					
		Adult		Child		Adult + Child	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
1,2-Dichloroethane	RME	9.6E-07	1.6E-03	6.8E-07	4.7E-03	**1.6E-06**	6.3E-03
bis(2-Chloroethyl)ether	RME	**4.7E-05**	NC	**3.3E-05**	NC	**8.0E-05**	NC
Benzene	RME	9.5E-07	1.3E-02	6.7E-07	3.8E-02	**1.6E-06**	5.2E-02
Tetrachloroethene	RME	8.1E-07	4.7E-04	5.7E-07	1.3E-03	**1.4E-06**	1.8E-03
Trichloroethene	RME	**5.2E-05**	**1.4E+00**	**3.7E-05**	**3.8E+00**	**8.9E-05**	**5.2E+00**
Vinyl chloride	RME	**1.5E-06**	2.2E-03	**2.1E-06**	6.1E-03	**3.6E-06**	8.3E-03
1,2-Dichloroethane	CTE	2.7E-07	4.7E-04	2.0E-07	1.3E-03	4.7E-07	1.8E-03
bis(2-Chloroethyl)ether	CTE	**1.3E-05**	NC	**9.6E-06**	NC	**2.3E-05**	NC
Trichloroethene	CTE	**1.5E-05**	3.8E-01	**1.1E-05**	**1.1E+00**	**2.5E-05**	**1.5E+00**
Vinyl chloride	CTE	4.3E-07	6.2E-04	6.0E-07	1.8E-03	**1.0E-06**	2.4E-03

The total cancer RME risks for both child and adult (Table 5-12a) were 2×10^{-4}. The total RME hazard index for the combined child and adult receptors for all chemicals was 2.0 (Table 5-12a).

5.10 Deep GW AOC 4 (Base of Upper Middle PRM South of Swindell Pond)[23]

For Deep Ground Water (AOC 4) exposures, potential cancer and non-cancer risks associated with future exposures to deep ground water were evaluated for an adult and child resident. In

[23] The risks calculated for AOC 4 South of Swindell Pond are also representative of potential exposure scenarios on a portion of the West Side Property (adjacent to BROS). However, the residence on that property is connected to municipal supply and surface water (Gaventa Pond) is used for irrigation rather than ground water.

addition, potential cancer and non-cancer risks associated with future deep ground water exposures during irrigation practices were evaluated for an adult and child.

5.10.1 Residential Use of Groundwater from GW AOC-4

For the residential scenario (Table 5-7a), potential cancer effects were evaluated for nine chemicals, and potential non-cancer effects were evaluated for 11 chemicals. Adult, child and lifetime (adult plus child) exposures were evaluated for this exposure pathway. Detailed risk calculations are provided in the following Annex B tables:

Pathway	Adult	Child
GW: Ingestion	B-47a, B-47b	B-48a, B-48b
GW: Inhalation while showering	B-57, B-58	B-63, B-64
GW: Dermal contact while showering	B-59, B-60a, B-60b	B-61, B-62

While certain exposure factors for the ground water ingestion risk calculation were modified to reflect CTE-type exposure, the inhalation of vapors while showering pathway could not support reduction in any of its exposure factors. Consequently the risks calculated for the RME or CTE cases for this exposure pathway are the same.

Separate Annex B tables for the lifetime (adult plus child) exposures were not prepared since these are the sum of the adult and child risk results. The cumulative risk results across all chemicals are summarized below for the adult, child, and lifetime (adult plus child) receptors:

		Groundwater-Based					
		Ingestion		Showering		Combined	
Receptor	Exposure	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Adult	RME	3.0E-03	5.4E+00	2.7E-03	2.2E+00	5.7E-03	7.6E+00
	CTE	1.7E-03	3.1E+00	2.7E-03	2.2E+00	4.4E-03	5.3E+00
Child	RME	2.6E-03	1.8E+01	2.0E-02	1.8E+00	2.2E-02	2.0E+01
	CTE	1.5E-03	1.0E+01	2.0E-02	1.8E+00	2.1E-02	1.2E+01
Adult + Child	RME	5.6E-03	2.3E+01	2.3E-02	4.0E+00	2.8E-02	2.7E+01
	CTE	3.2E-03	1.3E+01	2.3E-02	4.0E+00	2.6E-02	1.7E+01

Estimated cancer and non-cancer risks were above their respective thresholds for the both the RME and CTE cases, and for all the evaluated residential receptors, for all exposure pathways.

The estimated cancer and non-cancer risks for the individual chemicals are summarized in the table below for the RME case.

Chemical	RME Case Only Adult Plus Child Ingestion		Showering (Dermal Plus Inhalation)		Combined	
	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Arsenic	**1.9E-04**	**3.0E+00**	**5.6E-06**	2.2E-02	**1.9E-04**	**3.1E+00**
bis(2-Chloroethyl)ether	**4.7E-03**	NE	**2.1E-02**	NE	**2.6E-02**	NE
1,1,2,2-Tetrachloroethane	**2.5E-05**	1.5E-02	**2.3E-05**	6.3E-03	**4.8E-05**	2.2E-02
1,1,2-Trichloroethane	**2.0E-06**	6.5E-02	**2.2E-06**	3.3E-02	**4.3E-06**	9.8E-02
1,1-Dichloroethene	NE	5.3E-03	NE	1.9E-03	NE	7.2E-03
1,2-Dichloroethane	**5.2E-05**	2.1E-01	**2.4E-05**	8.8E-01	**7.6E-05**	**1.1E+00**
Benzene	**4.1E-05**	**1.4E+00**	**4.8E-05**	6.0E-01	**8.9E-05**	**2.0E+00**
Chloroform	NE	2.0E-01	NE	5.1E-02	NE	2.5E-01
cis-1,2-Dichloroethene	NE	7.4E-01	NE	5.3E-01	NE	**1.3E+00**
Tetrachloroethene	**8.3E-06**	1.1E-02	**1.4E-05**	5.9E-03	**2.3E-05**	1.7E-02
Trichloroethene	**2.7E-04**	**1.7E+01**	**1.9E-04**	**1.4E+00**	**4.6E-04**	**1.8E+01**
Vinyl chloride	**3.3E-04**	7.9E-01	**9.0E-04**	5.0E-01	**1.2E-03**	**1.3E+00**

Three chemicals, TCE, vinyl chloride, and BCEE comprise more than 95 percent of the total Site-related RME cancer risk[24]. About 95% of the non-cancer RME risk was attributable to TCE, arsenic, benzene, vinyl chloride, and cis-1,2-dichloroethene.

The estimated cancer and non-cancer risks for the individual chemicals are summarized in the table below for the CTE case.

Chemical	CTE Case Only Adult Plus Child Ingestion		Showering (Dermal Plus Inhalation)		Combined	
	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Arsenic	**1.1E-04**	**1.7E+00**	**5.6E-06**	2.2E-02	**1.1E-04**	**1.8E+00**
bis(2-Chloroethyl)ether	**2.7E-03**	NE	**2.1E-02**	NE	**2.4E-02**	NE
1,1,2,2-Tetrachloroethane	**1.4E-05**	8.8E-03	**2.3E-05**	6.3E-03	**3.7E-05**	1.5E-02
1,1,2-Trichloroethane	**1.2E-06**	3.7E-02	**2.2E-06**	3.3E-02	**3.4E-06**	7.0E-02
1,1-Dichloroethene	NE	3.0E-03	NE	1.9E-03	NE	5.0E-03
1,2-Dichloroethane	**3.0E-05**	1.2E-01	**2.4E-05**	8.8E-01	**5.4E-05**	1.0E+00

[24] While arsenic was evaluated and provided on the summary table, it was found to be not Site-related (Chapters 4 and 5 of RI)

Chemical	CTE Case Only					
	Adult Plus Child					
	Ingestion		Showering (Dermal Plus Inhalation)		Combined	
	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Benzene	**2.3E-05**	7.9E-01	**4.8E-05**	6.0E-01	**7.2E-05**	**1.4E+00**
Chloroform	NE	1.1E-01	NE	5.1E-02	NE	1.7E-01
cis-1,2-Dichloroethene	NE	4.2E-01	NE	5.3E-01	NE	9.5E-01
Tetrachloroethene	**4.8E-06**	6.5E-03	**1.4E-05**	5.9E-03	**1.9E-05**	1.2E-02
Trichloroethene	**1.6E-04**	**9.7E+00**	**1.9E-04**	**1.4E+00**	**3.4E-04**	**1.1E+01**
Vinyl chloride	**1.9E-04**	4.5E-01	**9.0E-04**	5.0E-01	**1.1E-03**	9.5E-01

The combined CTE risk estimates (Table 5-7b) were virtually identical to the RME risk estimates, as the inhalation of shower vapor dominates the risk estimates[25]. The same chemicals that dominated the RME risk estimates also dominated the risk estimates for the CTE case.

5.10.2 Agricultural Use of Groundwater from GW AOC-4

For the agricultural scenario, potential cancer effects were evaluated for ten chemicals, and 11 chemicals were evaluated for potential non-cancer effects. Adult, child and lifetime (adult plus child) exposures were evaluated for this exposure pathway. Detailed risk calculations are provided in the following Annex B tables:

Pathway	Adult	Child
GW: Inhalation	B-67a, B-67b	B-68a, B-68b
GW: Dermal contact	B-71a, B-71b	B-72a, B-72b

Separate Annex B tables for the lifetime (adult plus child) exposures were not prepared since these are the sum of the adult and child risk results. The cumulative risk results across all chemicals are summarized below for the adult, child, and lifetime (adult plus child) receptors:

[25] While certain exposure factors for the ground water ingestion risk calculation were modified to reflect CTE-type exposure, the vapor inhalation analysis could not support reduction in any of its exposure factors. Thus, total risk estimates remained unchanged between the RME and CTE analysis, as the vapor inhalation pathway drove the risk results.

Receptor	Exposure	Ground Water - Based	
		Cancer	Non-Cancer
Adult	RME	**3.6E-06**	1.4E-02
	CTE	6.0E-07	2.3E-03
Child	RME	**1.0E-05**	1.8E-01
	CTE	**1.7E-06**	2.9E-02
Adult + Child	RME	**1.4E-05**	2.0E-01
	CTE	**2.3E-06**	3.1E-02

The total RME cancer risks for adult, child, and lifetime (adult plus child) receptors exposed to GW AOC-4 ground water was above the threshold of 1 x 10^{-6}. The total CTE cancer risks for adult and lifetime (adult plus child) receptors exposed to GW AOC-4 were also above the threshold of 1 x 10^{-6}, and the adult CTE risk was below the threshold of 1 x 10^{-6}. The potential cancer risks are driven by the dermal exposure route, as shown in the table below.

Potential Cancer Risks Only			
Receptor	Exposure	Ground Water - Based	
		Dermal	Inhalation
Adult	RME	**2.8E-06**	7.6E-07
	CTE	4.7E-07	1.3E-07
Child	RME	**9.6E-06**	5.3E-07
	CTE	**1.6E-06**	8.9E-08
Adult + Child	RME	**1.2E-05**	**1.3E-06**
	CTE	**2.1E-06**	2.2E-07

The total non-cancer hazard indices for adult, child and lifetime (adult plus child) receptors were all below one.

The table below summarizes the individual chemicals that exceeded the cancer risk threshold of 1 x 10^{-6} for the lifetime exposure (adult plus child) under the RME case.

Potential Cancer Risks Only			
Chemical	Adult + Child RME Case Only		
	Inhalation	Dermal	Combined
bis(2-Chloroethyl)ether	—	**8.7E-06**	**8.7E-06**
Trichloroethene	8.6E-07	**1.7E-06**	**2.5E-06**
Vinyl chloride	2.1E-08	**1.1E-06**	**1.2E-06**

None of the individual chemicals exceeded the cancer risk threshold for the inhalation exposure route. For the dermal exposure route, three chemicals [bis(2-Chloroethyl)ether, trichloroethene, and vinyl chloride] had cancer risks above the threshold of 1×10^{-6}.

Summary of Risks Associated With Ground Water South of Swindell Pond and Interstate 295

Ground water withdrawn from some areas of the base (bottom 15 feet) of the Upper Middle PRM and consumed as potable would pose an unacceptable risk to human health. However, as recognized in the approved CEA/WRA, the distribution of BROS COPCs above acceptable risk levels and NJ GWQSs is highly limited vertically and extends over a relatively limited area horizontally beyond the I-295 right-of-way and LTC/LTCS. The Upper PRM in this area is unaffected by BROS-related constituents and can provide an adequate supply for agricultural and residential uses currently and in the future. A confining layer and the upper portion of the Upper Middle PRM provide a barrier and a margin-of-safety between the Upper PRM and the CEA/WRA at the base of the Upper Middle PRM. Consequently, the risks associated with ground water AOC 4 are hypothetical risks because a viable and unimpacted water supply remains throughout the area of the well restriction area and there are no ground water users in AOC 4.

5.11 SURFACE WATER AND SEDIMENT POTENTIAL RISKS (AOC CS AND AOC LTCS)

For AOC CS and AOC LTSC, potential cancer and non-cancer risks associated with current and future exposures to surface water and sediment during recreational activities were evaluated for an adult and child (Table 5-10).

5.11.1 AOC CS Sediments and Surface Water

Detailed risk calculations are provided in the following Annex B tables for the evaluation of this AOC:

Pathway	Adult	Child
Sed: Ingestion and dermal contact	B-73	B-74
SW: Dermal contact	B-77	B-78

For AOC CS, potential cancer risks were evaluated for one chemical (total PCBs) in both sediments and surface water, and potential non-cancer risks were evaluated for 15 chemicals in sediments and 27 chemicals in the surface water. The cumulative risk results across all chemicals are summarized below for the adult, child, and lifetime (adult plus child) receptors:

Receptor	Exposure	Surface Water		Sediment		Combined	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Adult	RME	1.8E-07	2.4E-03	1.2E-07	1.1E-02	3.0E-07	1.3E-02
	CTE	NE	NE	NE	NE	NE	NE
Child	RME	7.7E-08	3.8E-03	1.2E-07	4.0E-02	1.9E-07	4.4E-02
	CTE	NE	NE	NE	NE	NE	NE
Adult + Child	RME	2.6E-07	6.3E-03	2.3E-07	5.1E-02	4.9E-07	5.7E-02
	CTE	NE	NE	NE	NE	NE	NE

The RME lifetime cancer risk estimate was below the threshold of 1×10^{-6}. All of the non-cancer hazard quotients were below their threshold of one. The CTE risks were not calculated since the RME risks were below their respective risk thresholds.

Based on this assessment, there are no significant cancer or non-cancer risks associated with sediment or surface water contact by these receptors in AOC CS (Cedar Swamp).

5.11.2 AOC LTCS Sediments and Surface Water

For AOC LTCS, potential cancer risks were evaluated for one chemical (total PCBs) in both sediments and surface water, and potential non-cancer risks were evaluated for three chemicals in sediments and two chemicals in the surface water. Detailed risk calculations are provided in the following Annex B tables for the evaluation of this AOC:

Pathway	Adult	Child
Sed: Ingestion and dermal contact	B-75	B-76
SW: Dermal contact	B-79	B-80

The cumulative risk results across all chemicals are summarized below for the adult, child, and lifetime (adult plus child) receptors:

Receptor	Exposure	Surface Water		Sediment		Combined	
		Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
Adult	RME	3.3E-08	2.6E-03	2.9E-07	2.4E-02	3.2E-07	2.6E-02
	CTE	NE	NE	NE	NE	NE	NE
Child	RME	1.3E-08	4.1E-03	2.8E-07	9.2E-02	2.9E-07	9.6E-02
	CTE	NE	NE	NE	NE	NE	NE
Adult + Child	RME	4.7E-08	6.7E-03	5.7E-07	1.2E-01	6.1E-07	1.2E-01
	CTE	NE	NE	NE	NE	NE	NE

The RME lifetime cancer risk estimate was below the threshold of 1×10^{-6}. All of the non-cancer hazard quotients were below their threshold of one. The CTE risks were not calculated since the RME risks were below their respective risk thresholds.

Based on this assessment, there are no significant cancer or non-cancer risks associated with sediment or surface water contact by these receptors in AOC LTCS (Little Timber Creek Swamp).

5.12 Discussion of Uncertainties

An important facet of the method and use of human health risk assessment concerns the recognition of uncertainties and limitations inherent in the process, which arise in connection with dose-response models, animal-to-human extrapolation, chemical fate and transport models, models of potential exposure, and the collection, chemical analysis, and statistical treatment of environmental sampling data.

Point estimate (deterministic) risk analyses such as that used in this HHRA are regarded as introducing the highest level of uncertainty (in contrast to a probabilistic analysis which preserves full distributions of input data), as they represent only a small subset of data available. Moreover, use of upper-end (conservative) exposure factors (particularly in the case of the RME exposure), may result in multiplicative conservatism, as the product of these factors can generate risk estimates that may be several orders of magnitude higher than actual site risks.

Other aspects of the risk assessment and its associated data sets and models may result in overstated or understated risk estimates, although the precautionary nature of the risk assessment process is designed to typically result in overestimated risks rather than an underestimate. In this analysis, a number of issues could affect the degree to which the risk results in this HHRA may have overestimated or underestimated the true level of risk. The more important of these are discussed below.

Exposure Assumptions: Exposure assumptions are typically developed to provide conservative estimates of the potential risks. Although efforts are made to make these as realistic as possible, in some cases extreme estimates for the exposure assumptions may be used as inputs to the risk calculations. For example, the RME case for the irrigation exposure scenario was based under the assumption of a continuous drought condition. Such a condition would be atypical in the northeastern US, where drought events are generally short-lived (less than one year) and are not continuous over multiple years. This would therefore represent a rare event for the receptors evaluated in this risk assessment. The CTE Case for this exposure scenario was developed to provide a more realistic assumption of the potential risks.

Toxicity factors: Cancer and non-cancer toxicity factors are themselves a potentially significant source of uncertainty in all health risk assessments, as the underpinning of many of these values are derived from animal (laboratory) studies whose effects have been conservatively extrapolated to humans. In the process of extrapolating to humans, multiple safety factors are applied to ensure that the final criterion is protective of even the most sensitive human populations. In the case of TCE[26], for example, the table below shows former (withdrawn) USEPA provisional toxicity values as well as current provisional values. The differences in simply the toxicity factors alone are 20-fold between the withdrawn and current provisional Oral RfD, 36-fold for the oral cancer slope factor, and 67-fold for the inhalation cancer slope factor. In other words, if the withdrawn provisional values were re-instated, risks would be lowered for TCE by 20- to 67-fold depending on the exposure pathway in question.

[26] After a recent review of the toxicity of trichloroethylene, USEPA modified TCE's CSF and RfD. While USEPA's goal was to base the revisions on a number of "state-of-the-science" studies, the provisional values and USEPA's approach have come under strong criticism leading to question whether the provisional values are valid. In its evaluation of carcinogenicity, USEPA did not provide equal weight to non-linear modeling of TCE carcinogenesis as was applied to the linear models. Equal weighting is justified by mechanistic information, which strongly suggests a threshold for the effect. Application of both linear and non-linear models for all valid datasets would provide an understanding of the true range of possible toxicity factors. In its approach in developing reference values for effects other than cancer, USEPA overestimated certain uncertainty factors, resulting in a reference dose (RfD) and reference concentration (RfC) for trichloroethylene that may be one to two orders of magnitude greater than those derived using standard conservative practices.

Summary of Dose-Response Data for TCE

Toxicity Value	Withdrawn Provisional USEPA Values [1]	Current Provisional Values [2]
Chronic Inhalation RfD	NA	0.0114 mg/kg-d
Chronic Oral RfD	0.006 mg/kg-d	0.0003 mg/kg-d
Oral Cancer Slope Factor	0.011 $(mg/kg-d)^{-1}$	0.4 $(mg/kg-d)^{-1}$
Inhalation Cancer Slope Factor	0.006 $(mg/kg-d)^{-1}$	0.4 $(mg/kg-d)^{-1}$

Notes:
1 – Data from: http://risk.lsd.ornl.gov/tox/toxvals.shtml#2.5%20Withdrawn%20Values
2 – Data from: http://oaspub.epa.gov/eims/eimsapi.dispdetail?deid=23249

A likely source of underestimation of risk is COPCs for which toxicity values are not available. Although a search was performed for either provisional toxicity values or structural surrogates, no acceptable toxicity values were identified for a small number of COPCs. This will likely result in an underestimation of risk. However, due to the small number of these contaminants, and their relatively low frequency of detection across the BROS site, any underestimation of risk is not predicted to be significant.

Iron and Manganese in Groundwater: Iron and manganese were analyzed in shallow and deep groundwater from both on-site and off-site locations. Each of the GW AOCs are discussed individually below:

- GW AOC-1a: For GW AOC 1a, which represents shallow on-site groundwater, the average iron concentration was 411.9 mg/L (range: 0.025 to 3,900 mg/L) and the average manganese concentration was 6.98 mg/L (range: 0.016 to 43.9 mg/L). Groundwater from this AOC was evaluated in the HHRA for potential dermal contact by construction workers. No risks were calculated for these samples since the only potential exposure pathway would be dermal contact by Construction Workers, and neither of these chemicals can be significantly absorbed through the skin.

- GW AOC-1b: For GW AOC 1b, the single sample for iron and manganese had reported concentrations of 1.68 mg/L and 0.174 mg/L, respectively. Groundwater from this AOC was evaluated in the HHRA for two receptor groups: residents and agricultural receptors. For residents, the potential exposure routes included ingestion, dermal contact while showering, and inhalation while showering. For agricultural receptors, the potential exposure routes included inhalation of volatiles and dermal contact. Risks were not calculated for potential dermal or inhalation exposure pathways by residents or agricultural receptors since neither of these chemicals can be absorbed significantly through the skin nor are considered volatile. Therefore, this uncertainty assessment was restricted to potential risks from the ingestion pathway. As summarized in the table below, none of the HQs, based on

the RME exposure assumptions used in the HHRA, were above the risk threshold of one.

GW AOC-1A, Adult and Child Residents, RME Case Only

Chemical	Adult HQ	Child HQ
Iron	0.172	0.563
Manganese	0.038	0.125

- GW AOC-1c: For GW AOC 1c, the single sample for iron and manganese had reported concentrations of 57.2 mg/L and 2.91 mg/L, respectively. Groundwater from this AOC was evaluated in the HHRA for potential dermal contact by construction workers, and recreational ingestion using a water fountain by residents. Risks were not calculated for potential dermal exposure by construction workers since neither of these chemicals can be absorbed through skin. The only reasonable potential exposure route from this area was ingestion of water fountain water by residents in the future. As summarized in the table below, none of the HQs, based on the RME exposure assumptions used in the HHRA, were above the risk threshold of one.

GW AOC-1C, Recreational Use (Water Fountain), Adult and Child, RME Case

Chemical	Adult HQ	Child HQ
Iron	0.0134	0.0378
Manganese	0.0015	0.0041

- GW AOC-3: GW AOC-3, which represented deeper on-site groundwater, the average iron concentration was 275 mg/L (range: 0.20 to 751 mg/L) and the average manganese concentration was 2.57 mg/L (range: 0.11 to 6.78 mg/L). Groundwater from this AOC was evaluated in the HHRA for recreational ingestion using a water fountain by residents. As summarized in the table below, none of the HQs, based on the RME exposure assumptions used in the HHRA, were above the risk threshold of one.

GW AOC-3, Recreational Use (Water Fountain), Adult and Child, RME Case

Chemical	Adult HQ	Child HQ
Iron	0.0644	0.1816
Manganese	0.0013	0.0036

- GW AOC-4: GW AOC-4, which represents deeper off-site groundwater south of

Route 295, had an average iron concentration of 59.56 mg/L (range: 11.1 to 94.7 mg/L) and the average manganese concentration was 0.50 mg/L (range: 0.19 to 0.75 mg/L). Groundwater from this AOC was evaluated in the HHRA for two receptor groups: residents and agricultural receptors. For residents, the potential exposure routes included ingestion, dermal contact while showering, and inhalation while showering. For agricultural receptors, the potential exposure routes included inhalation of volatiles and dermal contact. Risks were not calculated for potential dermal or inhalation exposure pathways by residents or agricultural receptors since neither of these chemicals can be absorbed through the skin nor are considered volatile. Therefore, this uncertainty assessment was restricted to potential risks from the ingestion pathway. As summarized in the table below, only the calculated HQs for iron were above the risk threshold of one for the RME or CTE cases for the residential receptors.

GW AOC-4, Residential Consumption, Adult and Child, RME and CTE Cases

Chemical	RME Case		CTE Case	
	Adult HQ	Child HQ	Adult HQ	Child HQ
Iron	6.10	19.97	3.45	11.58
Manganese	0.11	0.36	0.06	0.21

These HQ values are conservative since they assume 100% bioavailability of iron, the use of unfiltered groundwater for the risk calculations, and the absence of treatment of the groundwater by the residents.

While it is unknown what contribution, if any, of iron and manganese is associated with site-related activities, it is known that no site activities directly involved the uses of either iron or manganese and that these concentrations may be associated with background levels.

Exposure point concentrations: Chemicals in the environment rarely are distributed in a uniform manner, nor are they present in infinite (steady state) quantities. Use of the 95% UCL of the arithmetic mean media concentration, or the maximum detected value, consistent with USEPA policy, without taking into account source depletion over time, likely adds considerably to overestimated risks (USEPA, 1991). In addition to the factors that may overestimate the EPC, the calculated EPCs in this HHRA are based on current concentrations. Concentrations of certain contaminants such as TCE and PCE may degrade under specific conditions to yield contaminants that may be higher in toxicity, such as vinyl chloride. However, historical data

suggest that the concentrations of these degradation products will also continue to decrease. Therefore, this is not likely to be a source of significant underestimation of risk.

Other exposure point concentration assumptions that can lead to overestimates of calculated hypothetical risks include:

- The assumption that water is drawn only from the most elevated ground water concentration zone. This is not likely when the zone of elevated concentrations beyond the BROS Property is a narrow portion (15 feet) of the Upper Middle PRM aquifer. Over 100 feet of clean aquifer overlies the strata of concern. Consequently, a potable well with a typical 20 to 50 foot well screen is likely to draw only a portion, if any, from the strata of concern. In addition, an agricultural well would likely have an even larger screen interval and produce water with COPC concentrations substantially less than those recorded in the monitoring wells at the base of the aquifer.

- The ground water EPCs are based on unfiltered data, which are likely to result in higher concentrations than filtered data for metals and non-VOC compounds. Although the use of low-flow sampling methodologies will minimize the differences between unfiltered and filtered data, there is a potential for the unfiltered samples to yield higher concentrations. If the actual exposures were to occur to filtered results, the use of the unfiltered data would result in a potential overestimation of risk from metals and non-VOC compounds.

- The ground water concentrations utilized in the HHRA were obtained from samples collected by low flow sampling techniques rather than from a submersible pump used in potable wells. Studies at the BROS Site determined that concentrations of VOCs by low flow sampling yielded concentrations over 50% higher than would occur form the same well with a submersible pump.

Tentatively Identified Compounds (TICs): TICs are those compounds that are present in the sample but do not represent target analytes. They are identified from the instrument data libraries since they are not present in the standards used for the chemical analyses, and lack calibration information. Therefore, both their identifications and quantifications are not likely to be as accurate as they are for targeted compounds. For the BROS project, there were a number of TICs that were unidentified, or had "generic" identifications (e.g., unknown alkane, C11H16 aromatic), many of which were likely by-products of the used oil recovery operations on

the property. Although the unidentified or "generic" TICs are not predicted to show the same toxicity as the target compounds, the total cumulative risks across the target chemicals may be somewhat underestimated since the TICs were not included in the EPC calculations.

Bioavailability: The actual amount of chemical that is absorbed and metabolized in the human body is uncertain. Bioavailability is a function of a compound's chemical properties, the physical state of the medium to which an organism is exposed, and the ability of the organism to physiologically take up the chemical. To the extent that on a chemical-and person-specific basis true bioavailability is higher or lower then the values used in this analysis, final risk estimates would follow in step.

Background constituents: In its comments on the EPAR, USEPA (2002a) indicated that the Region did not allow for the screening of COPCs based on the occurrence of a particular compound in background locations on the BROS Property. Accordingly, while background constituent information was not used to screen compounds from further analysis in the HHRA, it is useful to evaluate the relative occurrence of particular chemicals in background sampling locations as well as ranges in concentrations.

In background surface and subsurface soil, as a general rule, inorganic constituents were detected with a high frequency (Table 2-1 shows the media-specific detection frequencies). The table below compares the background soil and soil AOC maximum concentrations for the metals retained as COCs.

Maximum Surface Soil Concentrations (mg/Kg) by AOC

Area	Arsenic	Chromium	Lead	Mercury
Background	13.8	50.8	50.4	0.087
AOC-1	7.7	31.5	30.4	0.091
AOC-2	5.7	21.4	45.7	0.079
AOC-3	3.0	20.5	5.0	0.016
AOC-4	1.8	6.0	14.1	0.042
AOC-5	2.4	11.5	6.6	0.009
AOC-6	1.2	14.8	18.5	0.01
AOC-BP	9.1	42.1	55.8	0.14

In some cases, the maximum reported background concentrations for key inorganic constituents (metals) of toxicological significance (including arsenic, chromium, and lead)

exceeded the AOC specific soil screening criteria. This suggests that some chemicals may be present at the BROS Site, but unrelated to waste handling operations. Arsenic is one such example. NJDEP (1993) reports arithmetic mean urban and suburban arsenic soil concentrations of 8.26 and 4.72 mg/Kg, respectively. Maximum urban and suburban arsenic soil concentrations are reported as 48.9 and 22.7 mg/Kg, respectively (NJDEP, 1993). The maximum observed background soil concentration of arsenic at BROS was 13.8 mg/Kg, which was well within the NJDEP background range. As shown in the table above, none of the measured arsenic values in any of the AOCs were greater than this background concentration. Because the risk assessment did not differentiate among Site-related versus background constituents, site related risks attributable to the inorganics may be overstated in some cases (particularly for arsenic) due to the inclusion of these background constituents in the quantitative estimates of risk.

Land use: While every effort has been made to consider all reasonable (and permitted) human uses of the BROS Property and environs, there is no guarantee that (1) all of these uses could or would occur, or (2) additional types of exposure may occur that are not included in this HHRA. Nevertheless, the range of potential current and foreseeable future human exposures presented in this analysis should capture the vast majority (if not all) of the potential human exposures at the BROS Site.

Exposure to Multiple Source Areas: In the unlikely event that a person might be exposed to COPCs across more than a one AOC, exposure and risk estimates would be higher than that presented for the specific individual AOCs. For example, if a person were to trespass on the BROS Property, drink water from a hypothetical fountain (withdrawing water from Ground water AOC 3) situated near Swindell Pond, and recreate in LTCS, the combined total cancer risk and non-cancer hazard index would be:

Hypothetical Multi-AOC/Hot Spot Exposure Scenario #1

BP Trespasser		Fountain Water Ingestion		LTCS Recreation		Total Cumulative Risk	
Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
1.0E-07	2.0E-02	**2.0E-04**	1.0E+00	6.0E-07	4.0E-02	**2.01E-04**	**1.1E+00**

Similarly, if person were to live near the BROS Property and use ground water from AOC 4 for potable as well as agricultural irrigation purposes, and recreate in LTCS, combined cancer and non-cancer risk would be:

Hypothetical Multi-AOC/Hot Spot Exposure Scenario #2

Agriculture (Spray Irrigation)		Residential		LTCS Recreation		Total Cumulative Risk	
Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
6.0E-07	2.0E-03	**3.0E-02**	**1.0E+01**	6.0E-07	4.0E-02	**3.0E-02**	**1.0E+01**

Finally, if a commercial worker worked in a building situated on the BROS Property (Hot Spot) and was exposed to BROS Property-related vapors, drank water from a fountain drawing water from AOC 3, and also has recreational exposure (dermal contact, incidental ingestion) to sediments, the total cross-area risks would be:

Hypothetical Multi-AOC/Hot Spot Exposure Scenario #3

Commercial Worker (BROS Property)		Fountain Water Ingestion		LTCS Recreation		Total Cumulative Risk	
Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer	Cancer	Non-Cancer
3.0E-03	**5.8E+01**	**2.0E-04**	1.0E+00	6.0E-07	4.0E-02	**3.2E-03**	**5.1E+01**

Despite potential additivity of risks over several AOCs, it should be noted that "hot spot" AOCs still drive risk issues, as their overall contribution to total cancer risk and non-cancer hazard index overshadows the lesser significant AOCs.

In summary, while the risk estimates provided in this HHRA represent a conservative (significantly health protective) portrayal of potential Site risks, the hypothetical possibility remains that combinations of exposures could occur (likely for limited duration) as described above that might lead to total Site risks higher than the estimates presented for individual AOCs. It must be remembered, however, that due to the many precautions taken in a RAGS-style risk analysis, which are designed to err significantly on the side of protection of public health, the probability of underestimating risks is, in all likelihood, quite low.

5.13 SUMMARY AND CONCLUSIONS

Consistent with USEPA Superfund risk assessment methodology, this analysis has presented conservative upper-bound estimates of cancer and non-cancer risk. Each area of concern (AOC) was evaluated for potential current and foreseeable future human exposures.

The following summary of the human health risk assessment identifies the key findings that may be relevant in subsequent analyses.

- Surface soil on and off the BROS Property does not pose a significant cancer or non-cancer risk to persons who may come in contact with trace residuals near the fringes of the former lagoon area (now capped with clean fill) as well as off-Property areas. Individual receptors evaluated in this HHRA for possible exposure to surface soil include trespassers, groundskeepers, and construction and utility workers. Similarly, subsurface soil also does not pose a significant cancer or non-cancer risk to construction and utility workers who may have to conduct work activities in any of the soil AOCs.

- With regard to COPCs in soil AOC 3 subsurface soil, RME cancer and non-cancer risk estimates in conjunction with a hypothetical construction worker and utility worker were all below the target risk benchmarks (1×10^{-6} for cancer, and 1.0 for hazard index). This indicates that current COPC concentrations in subsurface soil in soil AOC 3 do not pose an unacceptable level of risk for these receptors.

  For the non-cancer compounds, the largest number of non-cancer risks calculated above the risk threshold of 1 was from Soil Hot Spot 1 (7). Soil Hot Spot 1 also had the highest total non-cancer hazard quotient. The remaining scenarios ranged from 0 to 3 non-cancer chemicals above the risk threshold.

- With regard to the vapor modeling analysis, within a given exposure scenario, the largest number of cancer risks calculated above the risk threshold of 1×10^{-6} was for the former lagoon area (9), followed by Soil Hot Spot 1 (6). The highest total cancer risk was calculated for Soil Hot Spot 1. The remaining scenarios ranged from 0 to 4 cancer chemicals above the risk threshold.

- Hypothetical exposure to shallow ground water impacted by residual wastes by a construction worker in AOC 1A resulted in a slightly elevated (2×10^{-6}) cancer risk estimate for the RME analysis (CTE results were below a level of concern). This RME cancer risk estimate is at the conservative end of USEPA's acceptable risk range (1×10^{-6} to 1×10^{-4}) and, thus, is practically *de minimis*. The non-cancer HI for the RME dermal contact construction worker in GW AOC 1A was 4.0, which therefore exceeded

the benchmark HI of 1.0.[27] CTE total shallow ground water contact risks for the construction worker totaled 2.0 (also exceeded the non-cancer risk benchmark). Therefore, shallow ground water impacted by wastes in soils and LNAPL on the BROS Property (AOC 1A) poses a potential health risk to construction worker who may have regular and prolonged contact with it[28]. Should protective gloves and other barrier clothing be worn to inhibit or prevent skin contact with AOC 1A shallow ground water, these risk estimates would diminish and may even be zero, as exposures approximate zero. Beyond the area where shallow ground water is impacted by wastes by direct contact with the wastes, health based standards are not exceeded (Chapters 4 and 5 of RI).

- Sediment and surface water upper-end (RME) exposure calculations for the lifetime recreator utilizing Cedar Swamp and Little Timber Creek Swamp resulted in no exceedances of cancer and non-cancer risk benchmarks. Based on these results, sediments and surface water in both these systems do not pose a significant health risk to recreational users.

- Potential exposure to Deep Ground water in AOC 3 was evaluated for an adult and child

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[27] This HHRA uses a Hazard Index of 1.0 as a benchmark for evaluating predicted non-cancer effects, thus implying that an HI over 1.0 is indicative of unacceptable non-cancer hazards. An HI of 1.0 is often used as a screen to indicate whether there is a potential for adverse effects and HIs less than 1.0 are considered to be safe, thus requiring no additional evaluation (EPA, 1996; 2002d). However, HIs greater than 1.0 do not necessarily constitute a matter of concern or indicate that an adverse health effect will occur. They only indicate that a conservative threshold has been exceeded.

The HI is the ratio of the predicted dose to the RfD. The RfD represents a daily intake level (or dose) that will not result in non-cancer health effects. That level is typically calculated by applying multiple uncertainty factors to the no-effect or lowest-effect level in the underlying study. Thus, if the HI is less than 1.0, then the dose is less than the RfD and no risk is predicted. However, given the uncertainty factors and conservatism inherent in the derivation of the RfD, the converse is not true: a calculated HI greater than 1.0 does not necessarily mean that significant hazards are predicted.

The RfD is itself defined by the EPA as "an estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime" (EPA, 1988). With uncertainty spanning an order of magnitude or greater built into the very definition of the RfD, a calculated HI greater than 1.0 cannot and should not automatically be interpreted as presenting an unacceptable hazard or warranting remedial action. EPA has acknowledged this in a recent guidance memorandum (EPA, 2003c), stating that the RfD "does not represent a 'bright-line' between safety and risk. Because of the use of uncertainty factors in deriving the RfD so as not to underestimate the 'safe' level, the specific level at which actual risk from exposure begins above the RfD cannot be precisely calculated."

This view was also expressed in a report by the Presidential/Congressional Commission on Risk Assessment and Risk Management: "[U]se of risk estimates with bright lines, such as one-in-a-million, and single point estimates in general, provide a misleading implication of knowledge and certainty. As a result, reliance on command-and-control regulatory programs and use of strict bright lines in risk estimates to distinguish between safe and unsafe are inconsistent with the Commission's Risk Management Framework ...." (EPA, 1997b). Nevertheless, the results of the non-cancer risk evaluations in this HHRA are presented against this benchmark of an HI equal to 1.

[28] Construction worker shallow ground water exposure to GW AOC-1c did not result in exceedances of cancer or non-cancer risk benchmarks, even for the most highly exposed RME receptor.

who might ingest water from a fountain during recreational activities. Potential cancer effects were evaluated for 15 chemicals. The total cancer RME risk for lifetime exposure (child and adult combined) was 2×10^{-4} (Table 5-12a). Potential non-cancer effects were evaluated for 41 chemicals. The total RME hazard index for the combined child and adult receptors for all chemicals was 2.0 (Table 5-12a).

Because the RME exposures for Deep GW AOC 3 exceeded their respective cancer and non-cancer benchmarks, CTE exposure estimates were evaluated (Table 5-12b). The total cancer CTE risks for both child and adult (Table 5-12b) was 5×10^{-5}. The total CTE hazard index for the combined child and adult receptors for all chemicals was 0.6.

- In the case of RME (30-year) residential ground water exposures via ingestion, dermal contact and inhalation of vapors while showering with deep aquifer south of Swindell Pond (GW AOC 4) ground water, an elevated total cancer risk estimate of 3×10^{-2} resulted. Non-cancer risks for this same exposure scenario are also elevated (HI = 10.0). BCEE, TCE, and vinyl chloride account for the majority of risk in this analysis. It should be noted, however, that this analysis used steady state (non-diminishing or attenuating) ground water concentrations, and the concentration used was the maximum value from a single sampling location MW 17D while unaffected ground water is readily available at that location (above the strata of concern). Because no one actually resides in the location of MW-17D, the ground water use risk estimates presented herein are purely hypothetical.

- Agricultural uses of GW AOC 4 ground water were also quantitatively evaluated in this HHRA. RME dermal contact and inhalation cancer risks for a child (representing the worst case (most conservative) exposure scenario) hypothetically exposed to GW AOC 4 irrigation spray water totaled 2×10^{-6}. This RME cancer risk estimate is at the conservative end of USEPA's acceptable risk range (1×10^{-6} to 1×10^{-4}) and, thus, is practically *de minimis*. RME non-cancer child risks were below the HI benchmark of 1.0. Since unaffected ground water being readily available at this location (above the strata of concern), and the fact that an irrigation well is not currently in the location of MW-17D, future use of GW AOC 4 ground water should not pose a significant health risk.

Finally, the BROS Property is advancing to the Feasibility Study phase within the Superfund process. The USEPA is continuing to remove the free LNAPL and evaluate the option for

additional removal of soils and drum remnants. The FS recommends removal of elevated hydric soils/sediments in LTCS including the areas that may pose some risks to human health. In addition, the FS will be evaluating alternatives for remediation of the COPCs located beneath and near the BROS Property. The sum total of these remedial actions will further ensure that the likelihood of individuals coming in contact with BROS-related constituents over time will diminish, and with this reduction in exposure to COPCs, risks (real and hypothetical estimates) will also diminish.

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FIGURES

QUADRANGLE LOCATION

2,000' 0' 2,000'

LEGEND

APPROXIMATE BROS PROPERTY BOUNDARY

SOURCE

1.) U.S.G.S. BRIDGEPORT, N.J., QUADRANGLE 1967 7.5 MINUTE SERIES (TOPOGRAPHIC) PHOTOREVISED 1986 CONTOUR INTERVAL 10 FEET

Title:

BROS PROPERTY LOCATION MAP

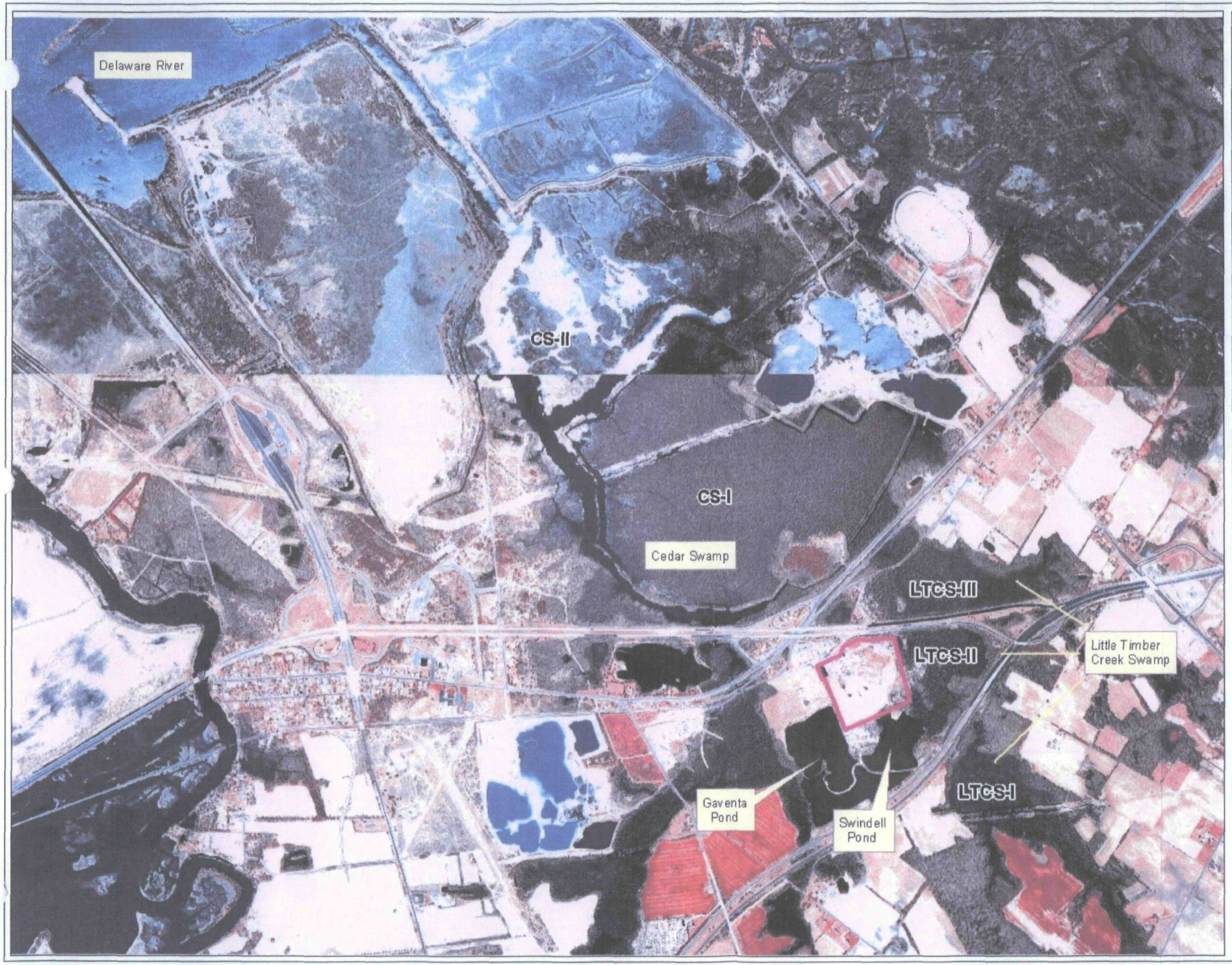
BRIDGEPORT RENTAL & OIL SERVICES SITE
LOGAN TOWNSHIP, NEW JERSEY

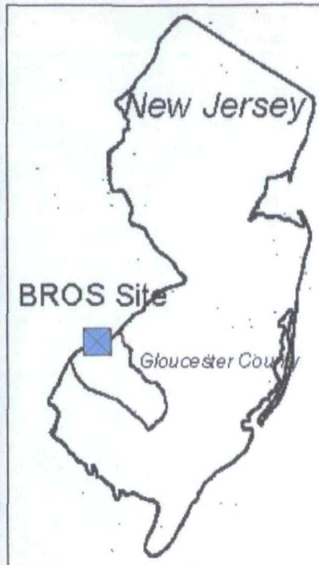
Prepared For:

BROS TECHNICAL COMMITTEE

ROUX ASSOCIATES, INC. Environmental Consulting & Management	Compiled by: B.G.	Date: 10/03/02	FIGURE 1-1
	Prepared by: JSG	Scale: AS SHOWN	
	Project Mgr: N.R.	Office: NJ	
	File No: 49301411	Project: 49301J	

800151





Locus Map

BROS Property Line

N

0 1000 2000 Feet

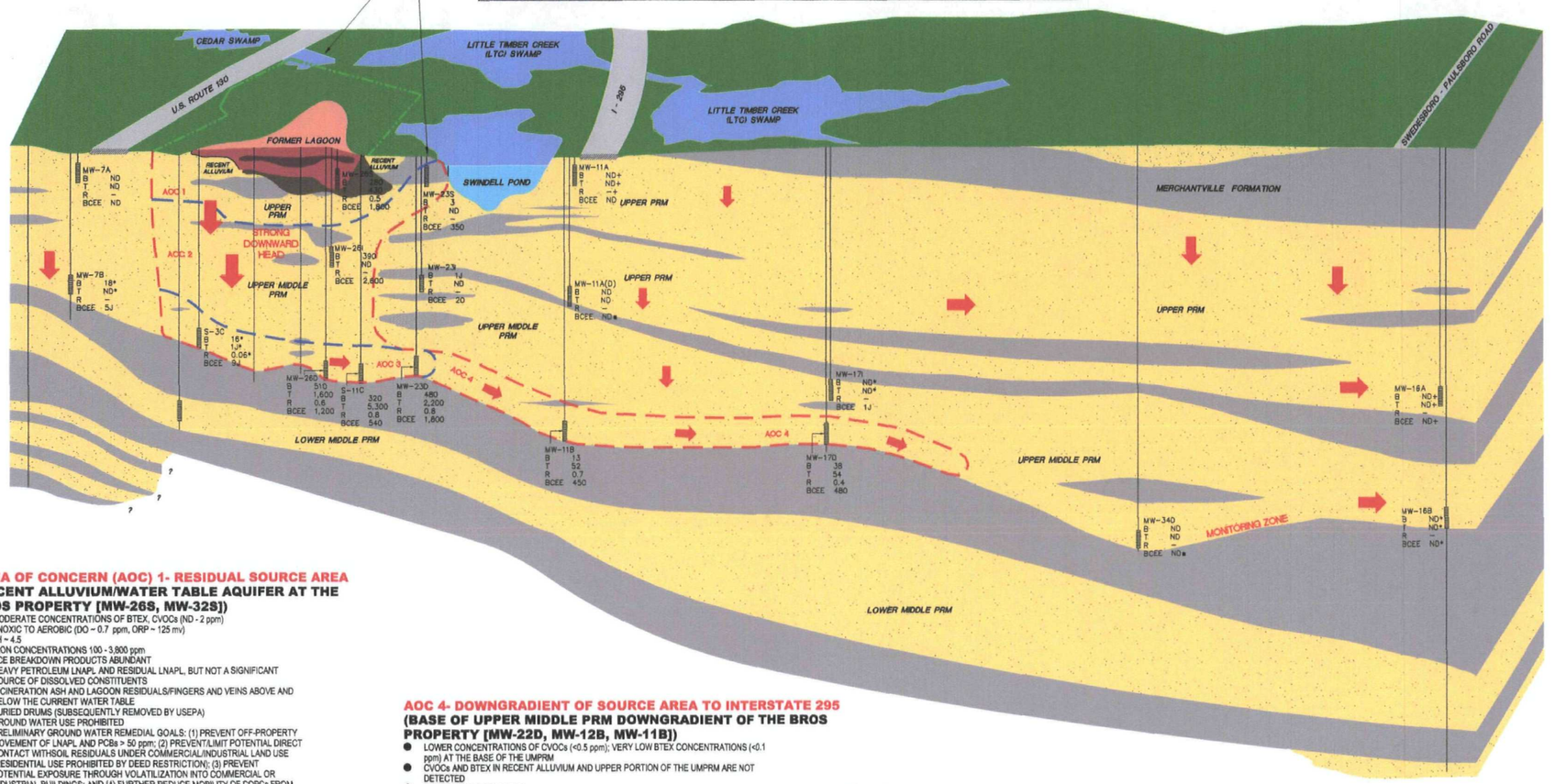
Figure 1-2. BROS Site and Surrounding Land/Surface Water Features

amec

D:\gis\portfolio\bros_s\fig\e 13\oldgpos.mxd
October 7, 2002 JCR

MASS FLUX FROM GROUND WATER TO SURFACE WATER IS LIMITED AND LOCALIZED

- PRIMARILY RELATED TO RESIDUAL LNAPL IN SURFACE SEDIMENT (TOP FOOT) NEAR FORMER BROS LAGOON AND IN THE NORTHEAST CORNER OF GAVENTA POND
- COPC TRANSPORT VIA SURFACE WATER IS NEGLIGIBLE
- SURFACE WATER IN SWINDELL POND IS CLEAN
- SURFACE WATER IN GAVANTA POND IS CLEAN OUTSIDE OF SMALL AREA IN NORTHEAST CORNER WHERE REMEDIATION IS PLANNED.



AREA OF CONCERN (AOC) 1- RESIDUAL SOURCE AREA (RECENT ALLUVIUM/WATER TABLE AQUIFER AT THE BROS PROPERTY [MW-26S, MW-32S])

- MODERATE CONCENTRATIONS OF BTEX, CVOCs (ND - 2 ppm)
- ANOXIC TO AEROBIC (DO ~ 0.7 ppm, ORP ~ 125 mv)
- pH ~ 4.5
- IRON CONCENTRATIONS 100 - 3,800 ppm
- TCE BREAKDOWN PRODUCTS ABUNDANT
- HEAVY PETROLEUM LNAPL AND RESIDUAL LNAPL, BUT NOT A SIGNIFICANT SOURCE OF DISSOLVED CONSTITUENTS
- INCINERATION ASH AND LAGOON RESIDUALS/FINGERS AND VEINS ABOVE AND BELOW THE CURRENT WATER TABLE
- BURIED DRUMS (SUBSEQUENTLY REMOVED BY USEPA)
- GROUND WATER USE PROHIBITED
- PRELIMINARY GROUND WATER REMEDIAL GOALS: (1) PREVENT OFF-PROPERTY MOVEMENT OF LNAPL AND PCBs > 50 ppm; (2) PREVENT/LIMIT POTENTIAL DIRECT CONTACT WITHSOIL RESIDUALS UNDER COMMERCIAL/INDUSTRIAL LAND USE (RESIDENTIAL USE PROHIBITED BY DEED RESTRICTION); (3) PREVENT POTENTIAL EXPOSURE THROUGH VOLATILIZATION INTO COMMERCIAL OR INDUSTRIAL BUILDINGS; AND (4) FURTHER REDUCE MOBILITY OF COPCs FROM RESIDUAL SOURCE AREAS AS NECESSARY TO PREVENT THE DISSOLUTION OF COPCs TO GROUND WATER AND THE OFF-PROPERTY MOVEMENT OF COPCs

AOC 2- DOWNWARD TRANSPORT AREA (UPPER MIDDLE PRM BENEATH THE BROS PROPERTY [MW-23I, MW-26I, MW-32I])

- LOWER CONCENTRATIONS OF BTEX, CVOCs (ND - ~0.5 ppm)
- ANOXIC TO AEROBIC (DO 0.3 - 1.8 ppm, ORP - 54 to 170 mv)
- pH ~ 5.4 - 7.7
- IRON CONCENTRATIONS >40 AND <200 ppm
- NO NAPL
- STRONG DOWNWARD HYDRAULIC HEAD AND GROUND WATER MOVEMENT THROUGHOUT THIS AOC
- GROUND WATER USE PROHIBITED BY DEED RESTRICTION
- PRELIMINARY GROUND WATER REMEDIAL GOAL: ASSUMING ADDITIONAL SOURCE AREA REMEDIATION (AOC-1) ABOVE, MONITORED NATURAL ATTENUATION WITH CONTINGENCY FOR ENHANCED BIODEGRADATION, IF NECESSARY TO PREVENT OFF-PROPERTY MOVEMENT OF COPCs IN SIGNIFICANT CONCENTRATIONS

AOC 3- GROUND WATER SOURCE AREA (BASE OF UPPER MIDDLE PRM BENEATH AND IMMEDIATELY ADJACENT TO THE BROS PROPERTY [MW-26D, MW-23D, S-11C])

- HIGH CONCENTRATIONS OF CVOCs (2 - 10 ppm) AND BTEX (~4 ppm)
- TCE BREAKDOWN PRODUCTS ABUNDANT
- ACETONE CONCENTRATIONS >30 ppm
- ANOXIC TO AEROBIC (DO 0.3 - 2.3 ppm, ORP -170 to 450 mv)
- pH ~ 1.8 - 3.8 (BIODEGRADATION PRECLUDED BY LOW pH)
- IRON CONCENTRATIONS >500 ppm
- DNAPL-LIKE CONDITION IDENTIFIED
- GROUND WATER USE PROHIBITED BY DEED RESTRICTION
- PRELIMINARY GROUND WATER REMEDIAL GOAL: REDUCE COPC CONCENTRATIONS AND MOBILITY TO ENSURE NATURAL ATTENUATION OF RESIDUAL BROS RELATED CHEMICALS ON BROS PROPERTY AND PRIOR TO RECEPTOR POINTS; CONSIDER CHEMICAL OXIDATION

AOC 4- DOWNGRADIENT OF SOURCE AREA TO INTERSTATE 295 (BASE OF UPPER MIDDLE PRM DOWNGRADIENT OF THE BROS PROPERTY [MW-22D, MW-12B, MW-11B])

- LOWER CONCENTRATIONS OF CVOCs (<0.5 ppm); VERY LOW BTEX CONCENTRATIONS (<0.1 ppm) AT THE BASE OF THE UMPRM
- CVOCs AND BTEX IN RECENT ALLUVIUM AND UPPER PORTION OF THE UMPRM ARE NOT DETECTED
- ACETONE NOT DETECTED
- TCE BREAKDOWN PRODUCTS ABUNDANT
- ANOXIC (DO 0.3 - 1.3 ppm, ORP -11 TO 350 mv)
- pH ~ 4.5 - 6.0
- IRON CONCENTRATIONS 40-300 ppm
- LOW GROUND WATER USE POTENTIAL (TO BE PROHIBITED IN NEAR FUTURE BY DEED RESTRICTION OF A PORTION OF THE UMPRM AQUIFER)
- PRELIMINARY GROUND WATER REMEDIAL GOAL: CONSIDER ENHANCED BIODEGRADATION (AEROBIC AND ANEROBIC) OF COPCs TO BE PROTECTIVE OF DOWNGRADIENT USES

AOC 4- DOWN GRADIENT OF SOURCE AREA - SOUTH OF INTERSTATE 295 (BASE OF UPPER MIDDLE PRM DOWNGRADIENT OF THE BROS PROPERTY [MW-17D, MW-18D, MW-19D])

- LOW CONCENTRATIONS OF CVOCs AND BTEX (~0.1 ppm) TRENDING TO ND BY MW-34D
- CVOCs AND BTEX IN UPRM AND UPPER PORTION OF UMPRM ARE NOT DETECTED
- ANAEROBIC TO ANOXIC (DO 0.2 - 1.7 ppm, ORP -40 TO 320 mv)
- pH 5.0 - 8.5
- IRON CONCENTRATIONS DECREASE ALONG FLOW PATH FROM 95 ppm TO BACKGROUND CONCENTRATIONS (15 TO 20 ppm AT THE BASE OF THE UPPER MIDDLE PRM)
- GROUND WATER IN USE (RESIDENTIAL AND AGRICULTURAL)
- GROUND WATER CEA/WRA OF LIMITED PORTIONS OF THE UPPER MIDDLE PRM AQUIFER
- PRELIMINARY GROUND WATER REMEDIAL GOAL: EVALUATE WEIGHT OF EVIDENCE SUPPORT FOR MONITORED NATURAL ATTENUATION

NOTE

GEOLOGIC CROSS-SECTION BASED UPON COMPILATION OF ALL RELEVANT PHASE 2 RI/FS DATA AND PRECEEDING SITE INVESTIGATIONS.

LEGEND

- ASH
- PEAT
- SAND
- BACKFILL
- SILT AND CLAY
- GROUND WATER FLOW DIRECTION
- DISTRIBUTION OF BROS RELATED CHEMICALS EXCEEDING MCLs
- BROS PROPERTY BOUNDARY
- BOUNDARY OF ADJACENT GROUND WATER AREAS OF CONCERN

B = BENZENE CONCENTRATION (ppb)

T = TCE CONCENTRATION (ppb)

BCEE = BIS(2-CHLOROETHYL)ETHER CONCENTRATION (ppb)

R = TCE / SUM OF TCE AND TCE BREAKDOWN PRODUCTS (DCE, VINYL CHLORIDE)

(ROUND 4 GROUND WATER DATA UNLESS OTHERWISE NOTED)

+ = INDICATES ROUND 1 GROUND WATER DATA

* = INDICATES ROUND 3 GROUND WATER DATA

■ = INDICATES RESULTS FROM BCEE SUPPLEMENTAL SAMPLING ROUND

BTEX = BENZENE, TOLUENE, ETHYLBENZENE, AND XYLENES

CVOCs = CHLORINATED VOLATILE ORGANIC COMPOUNDS (I.E. TRICHLOROETHENE [TCE], DICHLOROETHENES [DCE])

COPC = CHEMICAL OF POTENTIAL CONCERN

LNAPL = LIGHT NON-AQUEOUS PHASE LIQUID

DNAPL = DENSE NON-AQUEOUS PHASE LIQUID

ppm = PARTS PER MILLION (mg/l)

ppb = PARTS PER BILLION (ug/l)

mv = MILLIVOLTS

DO = DISSOLVED OXYGEN

ORP = OXIDATION REDUCTION POTENTIAL

CEA/WRA = CLASSIFICATION EXCEPTION AREA / WELL RESTRICTION AREA

NA = NOT ANALYZED

ND = NOT DETECTED

Title: CONCEPTUAL SITE MODEL - GROUND WATER PATHWAYS

BRIDGEPORT RENTAL & OIL SERVICES SITE
LOGAN TOWNSHIP, NEW JERSEY

Prepared For: BROS TECHNICAL COMMITTEE

ROUX ASSOCIATES, INC. Environmental Consulting & Management

Compiled by: JAL	Date: 03/18/04	FIGURE
Prepared by: JSG	Scale: AS SHOWN	
Project Mgr: NR	Office: NJ	1-3
File No: 463015I2	Project: 463012	

800153

AOC BROS PROPERTY - EXCLUDING AOC's HOT SPOTS 1 AND 2, INCINERATOR ASH, AND DEBRIS FILL AREAS

- SURFACE SOILS (0-1 FOOT BGS) ARE CLEAN, EXCEPT IN DEBRIS FILL AREA
- DEED RESTRICTIONS LIMIT POTENTIAL EXPOSURE, EXCAVATION BEYOND 4 FEET BGS UNLIKELY
- POTENTIAL FOR FUTURE INTRUSION OF VAPORS INTO ON-PROPERTY BUILDINGS
- ASH FROM INCINERATION OF LAGOON MATERIALS ENCOUNTERED WITHIN 2 FEET OF SURFACE
- LAND USE REGULATIONS PRECLUDE DEVELOPMENT IN DEBRIS FILL AREA B DUE TO WETLANDS

AOC SOIL-2 SWALE AREA

- LNAPL ON WATER TABLE (8-9 FEET BGS) IN UTILITY RIGHT OF WAY
- DEVELOPMENT PRECLUDED BY SIZE AND PROXIMITY TO ROUTE 130
- EXCAVATION BEYOND 6 FEET BGS UNLIKELY

AOC SOIL-5/5 SEEP WEST SIDE PROPERTY

- COPECS ENCOUNTERED AT SOIL/GROUND WATER INTERFACE (9-12 FEET BGS) ASSOCIATED WITH LNAPL, NO ACTIVITIES OCCUR TO THAT DEPTH, AND FUTURE ACTIVITIES ARE UNLIKELY
- ACCESS ROAD IS DEED SPECIFIED EASEMENT TO SOUTH SIDE PROPERTY
- FOR SEEP AREA, THE STEEP SLOPE AND LIMITED AREA PRECLUDE SIGNIFICANT DIRECT CONTACT
- FOR SEEP AREA, REMEDIATION WILL OCCUR PURSUANT TO THE 1984 RECORD OF DECISION
- LIMITED POTENTIAL FOR FUTURE VAPORS TO INTRUDE INTO ON-PROPERTY BUILDINGS

AOC SOIL-4 SOUTH SIDE PROPERTY

- SURFACE SOILS (0-1 FOOT BGS) ARE CLEAN
- COPECs ARE ASSOCIATED WITH LNAPL
- EXCAVATION BEYOND 4 FEET BGS UNLIKELY
- POTENTIAL DEVELOPMENT IS RESTRICTED BY LAND USE REGULATIONS ASSOCIATED WITH THE PROXIMITY TO WETLANDS AND SOILD WASTE DEPOSIT (BROS LAGOON ASH)

SOUTHBOUND U.S. ROUTE 130

U.S. ROUTE 130 NORTHBOUND

DECOMMISSIONED WASTEWATER TREATMENT PLANT

TRAILERS

HOT SPOT 1

HOT SPOT 2

AOC-3

ACCESS ROADWAY

LITTLE TIMBER CREEK SWAMP

GAVENTA POND

SWINDELL POND

N

LEGEND

- BROS PROPERTY LINE
- SOIL-1 – HOT SPOT 1 AREA (AOC-1)
- SOIL-2 – SWALE AREA (AOC-2)
- SOIL-3 – DEBRIS FILL AREA (AOC-3)
- SOIL-4 – SOUTH SIDE PROPERTY (AOC-4)
- SOIL-5 SEEP – GAVENTA POND SEEP AREA (AOC-5 SEEP)
- SOIL-5 – WEST SIDE PROPERTY (AOC-5)
- SOIL-6 – HOT SPOT 2 AREA (AOC-6)
- BP – BROS PROPERTY AOC
- AOC BP-ASH – INCINERATOR ASH

REFERENCE

1.) TOPOGRAPHIC SURVEY BY VARGO ASSOCIATES. AERIAL PHOTOGRAPHY FROM DECEMBER 1, 1999.

300' 0' 300'

Title:

CONCEPTUAL SITE MODEL
DEPICTING SOIL AREAS OF CONCERN ON AND ADJACENT TO BROS PROPERTY

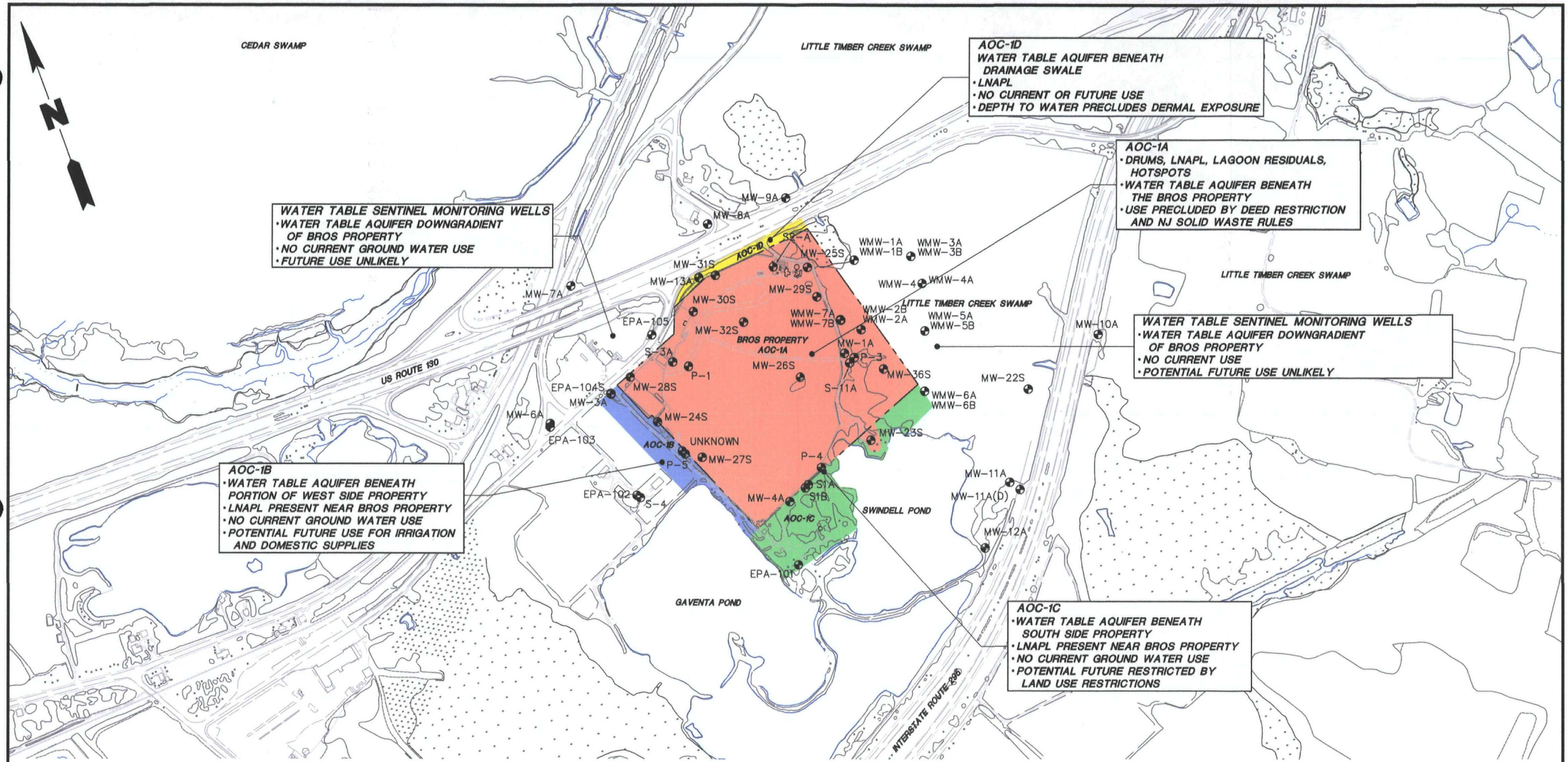
BRIDGEPORT RENTAL & OIL SERVICES SITE
LOGAN TOWNSHIP, NEW JERSEY

Prepared For: BROS TECHNICAL COMMITTEE

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: E.P.	Date: 10/03/02	FIGURE
Prepared by: A.T.S.	Scale: AS SHOWN	1-4
Project Mgr: N.R.	Office: NJ	
File No: 49301370	Project: 49301J	

800154



LEGEND

- BROS PROPERTY LINE
- EDGE OF WATER
- EDGE OF WOODS
- MW-6A — MONITORING WELL LOCATION AND IDENTIFICATION

REFERENCE

1.) SITE SURVEY PERFORMED BY DOUGLAS R. LONG OF WILLIAMSTOWN, NJ, DATED NOVEMBER 14, 1997.

2.) SAMPLE LOCATIONS PER VARGO ASSOCIATES.

3.) BASE MAP PREPARED BY VARGO ASSOCIATES, DATE OF FLYOVER 12/01/99.

Title:

CONCEPTUAL SITE MODEL FOR SHALLOW (WATER TABLE) GROUNDWATER AREAS OF CONCERN

BRIDGEPORT RENTAL & OIL SERVICES
LOGAN TOWNSHIP, NEW JERSEY

Prepared For:

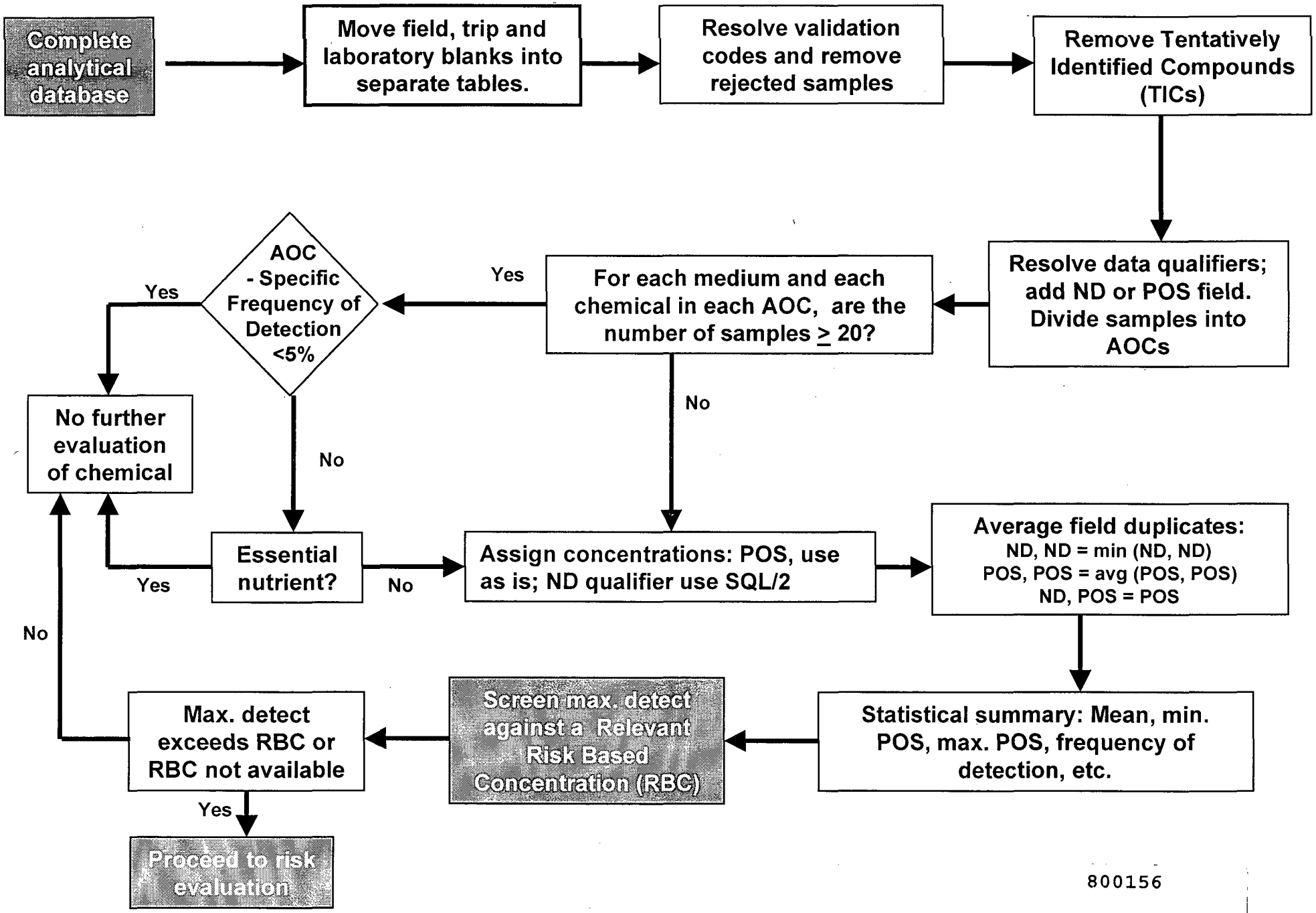
BROS TECHNICAL COMMITTEE

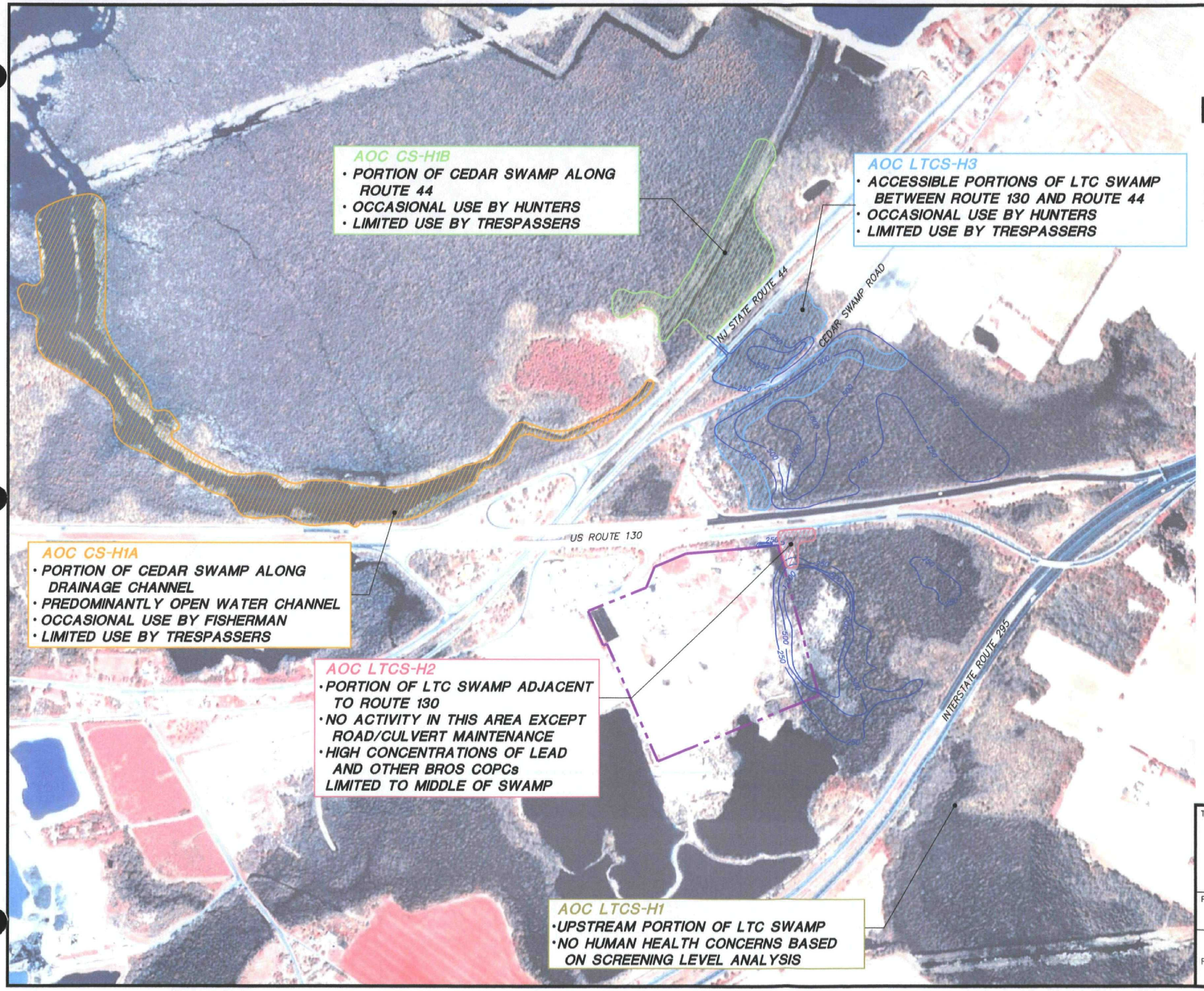
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: B.G.	Date: 10/03/02	FIGURE
Prepared by: J.R.M.	Scale: AS SHOWN	1-5
Project Mgr: N.R.	Office: NJ	
File No: 49301368	Project: 49301J	

800155

Figure 2-1: Flow Chart of Data Analysis Sequence for Identified Compounds in a Given Medium





Title:

CONCEPTUAL SITE MODEL FOR WETLANDS AREAS OF CONCERN OFF OF BROS PROPERTY

BRIDGEPORT RENTAL AND OIL SERVICES SITE
BRIDGEPORT, NEW JERSEY

Prepared For:

BROS TECHNICAL COMMITTEE

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: NR	Date: 11/18/01	FIGURE 3-1
Prepared by: JSG	Scale: AS SHOWN	
Project Mgr: NR	Office: NJ	
File No: 49301365	Project: 49301J	

800157

Legend

- BROS PROPERTY LINE
- FORMER BROS LAGOON
- BIOTA SAMPLING LOCATION

Note:
Average concentrations are shown.
Units are in mg/Kg, except for %lipid.

Figure 3-2
Cedar Swamp and Reference Area Primary COPEC Biota Chemical Results

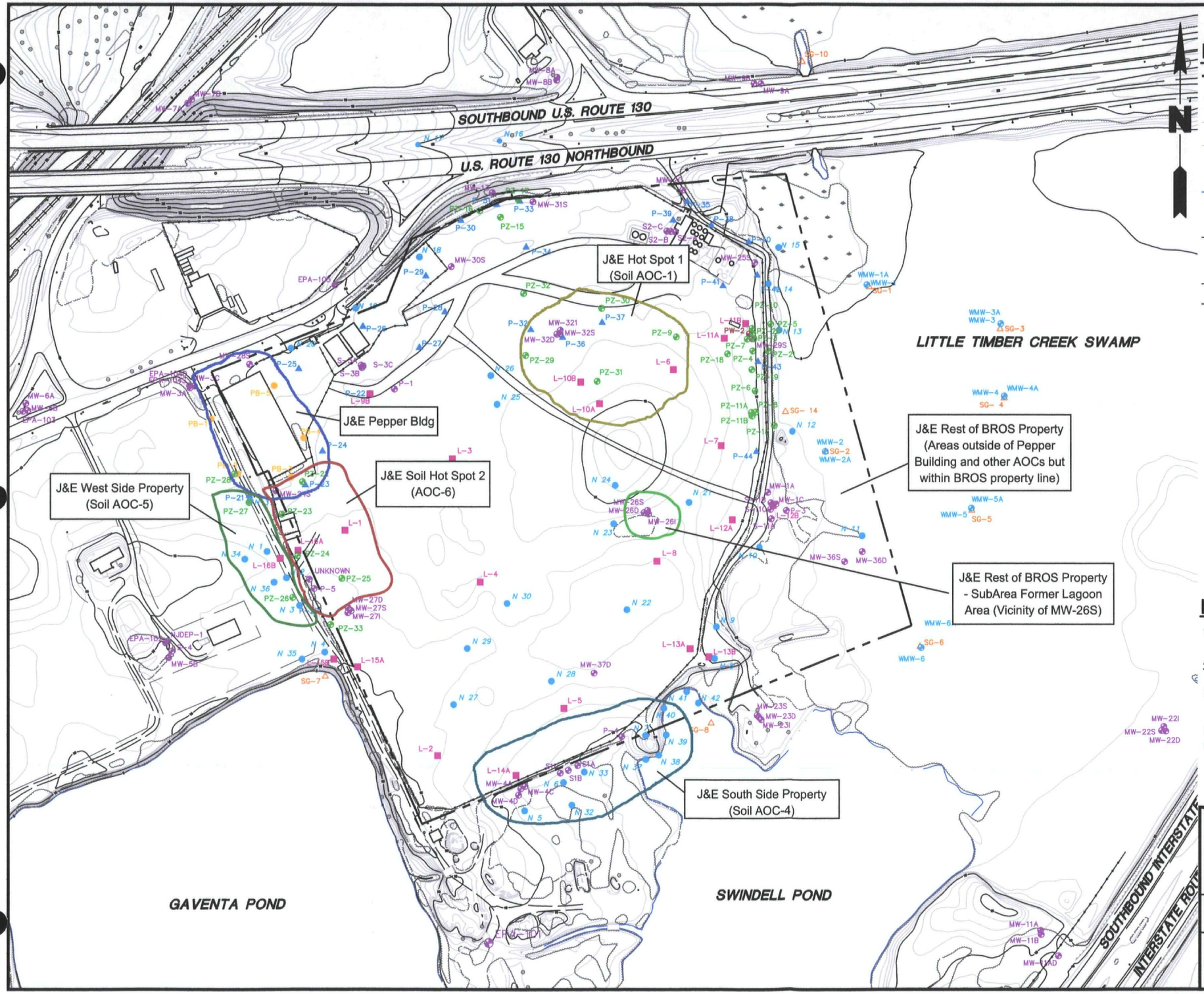
1000 0 1000 Feet

amec

July 26, 2001

N

800158



LEGEND

- BROS PROPERTY LINE
- 5 FOOT CONTOUR INTERVAL
- 1 FOOT CONTOUR INTERVAL
- DEPRESSED CONTOUR
- X 4.8 SPOT ELEVATION
- EDGE OF WATER
- EDGE OF WOODS
- EDGE OF PAVING
- GUARD RAIL
- FENCE
- RAILROAD
- EPA-5B MONITORING LOCATION AND IDENTIFICATION
- WMW-1 WETLAND MONITORING WELL LOCATION AND IDENTIFICATION
- L-13A LAGOON AREA BORING LOCATION AND IDENTIFICATION
- PB-4 PEPPER BUILDING BORING LOCATION AND IDENTIFICATION
- P-41 PROCESS AREA BORING LOCATION AND IDENTIFICATION
- SG-10 STAFF GAUGE LOCATION AND IDENTIFICATION
- N 30 LNAPL EVALUATION BORING LOCATION AND IDENTIFICATION

REFERENCE

1.) SITE SURVEY PERFORMED BY DOUGLAS R. LONG OF WILLIAMSTOWN, NJ, DATED NOVEMBER 14, 1997.

2.) SAMPLE LOCATIONS PER VARGO ASSOCIATES.

3.) BASE MAP PREPARED BY VARGO ASSOCIATES, DATE OF FLYOVER 12/01/99.

Note: Drawing modified from figure originally prepared by Roux Associates

200' 0' 200'

Title:
SOIL BORING, MONITORING WELL AND PIEZOMETER LOCATIONS EVALUATED USING THE JOHNSON & ETTINGER VAPOR INTRUSION MODEL
BRIDGEPORT RENTAL & OIL SERVICES SITE
LOGAN TOWNSHIP, NEW JERSEY

Prepared For:
BROS TECHNICAL COMMITTEE

ROUX ASSOCIATES, INC. Environmental Consulting & Management

Compiled by: WG	Date: 03/18/02	FIGURE	
Prepared by: JSG	Scale: AS SHOWN	3-3	
Project Mgr: NR	Office: NJ		
File No: 49301389	Project: 49301J		

800159

TABLES

Table 1-1
Identification of HHRA Samples
Soil
BROS Human Health Risk Assessment
Bridgeport, NJ

AOC		Depth (ft.)	Sample Location	Sample ID	Sample Date
On-Property					
AOC 1	Surface	0 - 0.17	P-36	P-36/SO/0-2	17-Aug-99
AOC 1	Subsurface	0 - 1	P-36	P-36/SO/0-1	12-Sep-00
AOC 1	Subsurface	0.17 - 1	P-36	P-36/SO/2-12	17-Aug-99
AOC 1	Subsurface	4 - 5	P-36	P-36/SO/4.0-5.0	17-Aug-99
AOC 3	Subsurface	5 - 5.5	P-44	P-44/SO/5-5.5	09-Jun-99
AOC 6	Subsurface	3 - 4	PB-3	PB-3/SO/3-4	21-Jun-99
AOC 6	Subsurface	5 - 5.5	PB-4	PB-41/SO/5-5.5	18-Jun-99
AOC 6	Subsurface	6 - 7	PB-4	PB-41/SO/6-7	18-Jun-99
AOC 6	Subsurface	6 - 7	PB-3	PB-3/SO/6-7	21-Jun-99
BP	Surface	0 - 0.17	P-26	P-26/SO/0-2	15-Jun-99
BP	Surface	0 - 0.17	P-34	P-34/SO/0-2	16-Aug-99
BP	Surface	0 - 0.5	N-40	N-40/SO/0-0.5	04-Dec-00
BP	Surface	0 - 0.5	N-41	N-41/SO/0-0.5	04-Dec-00
BP	Surface	0 - 0.5	N-42	N-42/SO/0-0.5	04-Dec-00
BP	Subsurface	0 - 1	P-26	P-26/SO/0-1 & DUP/9-12-00/SO/0-1	12-Sep-00
BP	Subsurface	0.17 - 1	P-26	P-26/SO/2-12	15-Jun-99
BP	Subsurface	0.17 - 1	P-34	P-34/SO/2-12	16-Aug-99
BP	Subsurface	1 - 1.5	PB-5	PB-5A/SO/1-1.5	18-Jun-99
BP	Subsurface	1 - 3	P-40	P40/SO/1-3	18-Aug-99
BP	Subsurface	3 - 4	PB-5	PB-5/SO/3-4 & PB-5/SO/3-4Dup	18-Jun-99
BP	Subsurface	3 - 4	P-38	P-38/SO/3-4	17-Aug-99
BP	Subsurface	4 - 4.5	P-43	P-43/SO/4-4.5	08-Jun-99
BP	Subsurface	4 - 4.5	P-27	P-27/SO/4-4.5	11-Jun-99
BP	Subsurface	4 - 4.5	P-26	P-26/SO/4-4.5	15-Jun-99
BP	Subsurface	4 - 4.5	N-19	N-19/SO/4-4.5	22-Sep-00
BP	Subsurface	4 - 5	L-11B	L-11B/SO/4-5	10-Aug-99
BP	Subsurface	4.5 - 5	MW-25S	MW-25S/SO/4.5-5	03-Aug-99
BP	Subsurface	4.5 - 5	MW-24S	MW24S/SO/4.5-5.0	28-Sep-99
BP	Subsurface	5 - 6	L-9B	L-9B/SO/5.0-6.0	23-Aug-99
BP	Subsurface	5 - 6	MW-31S	MW31S/SO/5-6	10-Sep-99
BP	Subsurface	5 - 6	MW-29S	MW-29S/SO/5-6	13-Sep-99

800161

Table 1-1
Identification of HHRA Samples
Soil
BROS Human Health Risk Assessment
Bridgeport, NJ

AOC		Depth (ft.)	Sample Location	Sample ID	Sample Date
Off-Property					
AOC 2	Surface	0 - 0.17	P-31	P-31/SO/0-2	20-Aug-99
AOC 2	Subsurface	0 - 1	P-31	P-31/SO/0-1	12-Sep-00
AOC 2	Subsurface	0.17 - 1	P-31	P-31/SO/2-12	20-Aug-99
AOC 2	Subsurface	5 - 6	P-30	P30/SO/5.0-6.0	19-Aug-99
AOC 2	Subsurface	5 - 6	P-31	P-31/SO/5-6	20-Aug-99
AOC 4	Subsurface	1 - 2	L-14B	L14B/SO/1.0-2.0	01-Sep-99
AOC 5	Subsurface	5 - 5.5	P-21	P-21/SO/5-5.5	14-Jun-99
BKGD	Surface	0 - 0.5	MW-18D	MW-18D/SO/0-0.5	22-Jun-99
BKGD	Surface	0 - 0.5	MW-17D	MW-17D/SO/0-0.5	19-Jul-99
BKGD	Surface	0 - 0.5	MW-19D	MW-19D/SO/0.0-0.5	28-Jul-99
BKGD	Surface	0 - 0.5	MW-20D	MW20D/SO/0-0.5	05-Oct-99
BKGD	Surface	0 - 0.5	MW-33D	MW-33D/SO/0-6	19-Aug-99
BKGD	Subsurface	1.5 - 2	MW-18D	MW-18D/SO/1.5-2	22-Jun-99
BKGD	Subsurface	1.5 - 2	MW-17D	MW-17D/SO/1.5-2	19-Jul-99
BKGD	Subsurface	1.5 - 2	MW-19D	MW-19D/SO/1.5-2.0	28-Jul-99
BKGD	Subsurface	1.5 - 2	MW-20D	MW20D/SO/1.5-2.0	05-Oct-99
BKGD	Subsurface	1.5 - 2	MW-20D	MW20DD/SO/1.5-2.0	05-Oct-99
BKGD	Subsurface	1.5 - 2	MW-33D	MW-33D/SO/0-6	19-Aug-99
BKGD	Subsurface	2 - 2.5	MW-18D	MW-18D/SO/2-2.5	22-Jun-99
BKGD	Subsurface	2 - 2.5	MW-19D	MW-19D/SO/2.0-2.5	28-Jul-99
BKGD	Subsurface	2.5 - 3	MW-22D	MW22D/SO/2.5-3.0	08-Nov-99
BKGD	Subsurface	2.5 - 3	MW-22D	MW22DA/SO/2.5-3.0	08-Nov-99
BKGD	Subsurface	3 - 4	MW-21D	MW-21D/SO/3-4	24-Nov-99
BKGD	Subsurface	4 - 5	N-16	N-16/SO/4-5	17-Oct-00

Notes:
AOC - Area of Concern
BKGD - Site Background

Table 1-2
Identification of HHRA Samples
Sediment and Surface Water
BROS Human Health Risk Assessment
Bridgeport, NJ

AOC	Depth (ft.)	Sample Location	Sample ID	Sample Date
Sediment				
BKGD	0 - 0.5	RA-1	RA-1/SED/0-6/R1C	30-Jun-00
BKGD	0 - 0.08	RA-2	RA-2/SED/0-1/R1C	30-Jun-00
BKGD	0 - 0.5	RA-2	RA-2/SED/0-6/R1C	30-Jun-00
BKGD	0 - 0.08	RA-3	RA-3/SED/0-1/R1C	30-Jun-00
BKGD	0 - 0.5	RA-3	RA-3/SED/0-6/R1C	30-Jun-00
BKGD	0 - 0.08	RA-4	RA-4/SED/0-1/R1C	30-Jun-00
BKGD	0 - 0.5	RA-4	RA-4/SED/0-6/R1C	30-Jun-00
BKGD	0 - 0.08	RA-5	RA-5/SED/0-6/R1C	30-Jun-00
BKGD	0 - 0.5	RA-6	RA-6/SED/0-6	2-Aug-00
BKGD	0 - 0.5	RA-7	RA7/SED/0-6 & DUPRA/SED	02-Aug-00
Cedar Swamp	0 - 0.5	CS-401	CS-401/0-0.5/SED/R2C	7-Dec-00
Cedar Swamp	0 - 0.5	CS-5	CS-5/SED/0.0-0.5	20-Dec-99
Cedar Swamp	0 - 0.5	CS-6	CS-6/0-0.5/SED/R2C	11-Dec-00
Cedar Swamp	0 - 0.5	CS-6	CS-6/SED/0.0-0.5	20-Dec-99
Cedar Swamp	0 - 0.5	CS-7	CS-7/SED/0.0-0.5	20-Dec-99
Cedar Swamp	0 - 0.5	CS-8	CS-8/SED/0.0-0.5	20-Dec-99
Cedar Swamp	0 - 0.5	CS-9	CS-9/SED/0.0-0.5	21-Dec-99
Cedar Swamp	0 - 0.5	LTC-94	LTC-94/SED/0-0.5/R2C	5-Dec-00
Cedar Swamp	0 - 0.5	LTC-95	LTC-95/SED/0-0.5/R2C	5-Dec-00
Cedar Swamp	0 - 0.5	LTC-96	LTC-96/SED/0-0.5	13-Oct-99
Cedar Swamp	0 - 0.5	LTC-99	LTC99/SED/0.0-0.5	12-Oct-99
Little Timber Creek Swamp	0 - 0.5	LTC-321	LTC-321/0-.5/SED/R2C	11-Dec-00
Little Timber Creek Swamp	0 - 0.5	LTC-322	LTC-322/0-.5/SED/R2C	11-Dec-00
Little Timber Creek Swamp	0 - 0.5	LTC-323	LTC-323/0-.5/SED/R2C	11-Dec-00
Little Timber Creek Swamp	0 - 0.5	LTC-53	LTC-53/0-0.5/SED/R2C	7-Dec-00
Little Timber Creek Swamp	0 - 0.5	LTC-59	LTC-59/SED/0-0.5/R2C	6-Dec-00
Little Timber Creek Swamp	0 - 0.5	LTC-80	LTC-80/0-0.5/SED/R2C	7-Dec-00
Little Timber Creek Swamp	0 - 0.5	LTC-89	LTC-89/0-0.5/SED/R2C	7-Dec-00

800163

Table 1-2
Identification of HHRA Samples
Sediment and Surface Water
BROS Human Health Risk Assessment
Bridgeport, NJ

AOC	Depth (ft.)	Sample Location	Sample ID	Sample Date
Surface Water				
BKGD LTCS	NA	RA-1	RA-1/SW	May-00
BKGD LTCS	NA	RA-2	RA-2/SW	May-00
BKGD LTCS	NA	RA-3	RA-3/SW	May-00
BKGD LTCS	NA	RA-4	RA-4/SW	May-00
BKGD LTCS	NA	RA-5	RA-5/SW	May-00
BKGD CS	NA	RA-6	RA6/SW	Aug-00
BKGD CS	NA	RA-7	RA7/SW & DUPRA/SW	Aug-00
Cedar Swamp	NA	CS-200	CS-200/SW & DUP-1/SW	Apr-00
Little Timber Creek Swamp	NA	LTC-200	LTC-200/SW	Apr-00
Little Timber Creek Swamp	NA	LTC-201	LTC-201/SW	Apr-00
Little Timber Creek Swamp	NA	LTC-58	LTC-58/SW	May-00

Notes:
AOC - Area of Concern
BKGD - Site Background
Cedar Swamp - CS-H1: From the Culvert to the Tide Gate
Little Timber Creek Swamp - LTCS-H3: From Route 130 to Route 44

Table 1-3
Identification of HHRA Samples
Ground water
BROS Human Health Risk Assessment
Bridgeport, NJ

AOC	Sample Location	Sample ID	Screen Depth (ft bgs)	Sampling Round	Sample Date
On-Property (Shallow)					
AOC 1a	MW-23	MW-23S/R2/GW	5 - 15	2	13-Jan-00
AOC 1a	MW-24S	MW-24S/R2/GW & DUP2/R2/GW	2 - 12	2	11-Jan-00
AOC 1a	MW-25S	MW-25S/R2/GW	2 - 12	2	13-Jan-00
AOC 1a	MW-26S	MW-26S/R2/GW	6 - 16	2	12-Jan-00
AOC 1a	MW-27S	MW-27S/R2/GW	6 - 16	2	10-Jan-00
AOC 1a	MW-28S	MW-28S/R2/GW	4 - 14	2	06-Jan-00
AOC 1a	MW-29S	MW-29S/R2/GW	3 - 13	2	13-Jan-00
AOC 1a	MW-30S	MW-30S/R2/GW	3 - 13	2	10-Jan-00
AOC 1a	MW-31S	MW-31S/R2/GW	3 - 13	2	14-Jan-00
AOC 1a	MW-32S	MW-32S/R2/GW & DUP3/R2/GW	6 - 16	2	14-Jan-00
AOC 1a	MW-1A	MW-1A/GW/R3	2 - 12	3	31-Oct-00
AOC 1a	MW-24S	MW-24S/GW/R3	2 - 12	3	30-Nov-00
AOC 1a	MW-25S	MW-25S/GW/R3	2 - 12	3	27-Oct-00
AOC 1a	P-5	P-5/GW/R3	14 - 19	3	30-Nov-00
AOC 1a	S-11A	S-11A/GW/R3	5 - 15	3	30-Nov-00
AOC 1a	S-3A	S-3A/GW/R3	5 - 15	3	01-Nov-00
AOC 1a	MW-2B	MW-2B/GW/R3	#N/A	3	03-Nov-00
AOC 1a	MW-23S	MW-23S/GW/R4	5 - 15	4	02-May-01
AOC 1a	MW-26S	MW-26S/GW/R4	6 - 16	4	03-May-01
AOC 1b	MW-3A	MW-3A/GW	4 - 14	1	12-Jul-99
AOC 1c	MW-4A	MW-4A/R2/GW	2 - 12	2	07-Jan-00
AOC 1c	MW-4A	MW-4A/GW/R3	2 - 12	3	31-Oct-00
AOC 1c	MW-4A	MW-4A/GW/R4	2 - 12	4	30-Apr-01
Off-Property					
AOC 3	MW-11B	MW11B/GW & MW11B/GW/DUP	132 - 142	2	06-Jan-00
AOC 3	MW-21D	MW-21D/R2/GW	112 - 122	2	12-Jan-00
AOC 3	MW-22D	MW-22D/R2/GW	125 - 135	2	10-Jan-00
AOC 3	MW-23D	MW-23D/R2/GW	101 - 111	2	13-Jan-00
AOC 3	MW-26D	MW-26D/R2/GW	106 - 116	2	12-Jan-00
AOC 3	MW-27D	MW-27D/R2/GW	106 - 116	2	10-Jan-00
AOC 3	MW-4D	MW-4D/R2/GW	105 - 115	2	07-Jan-00
AOC 3	MW-5B	MW-5B/R2/GW	100 - 110	2	06-Jan-00

Table 1-3
Identification of HHRA Samples
Ground water
BROS Human Health Risk Assessment
Bridgeport, NJ

AOC	Sample Location	Sample ID	Screen Depth (ft bgs)	Sampling Round	Sample Date
AOC 3	S-11C	S-11C/R2/GW	105 - 115	2	14-Jan-00
AOC 3	S-2C	S-2C/R2/GW	98 - 108	2	13-Jan-00
AOC 3	S-3C	S-3C/R2/GW	90 - 100	2	11-Jan-00
AOC 3	MW-11B	MW-11B/GW/R3	132 - 142	3	30-Oct-00
AOC 3	MW-23B	MW-12B/GW/R3	133 - 143	3	30-Oct-00
AOC 3	MW-32D	MW-21D/GW/R3	112 - 122	3	30-Oct-00
AOC 3	MW-22D	MW-22D/GW/R3	125 - 135	3	30-Oct-00
AOC 3	MW-23D	MW-23D/GW/R3 & DUP-11-2/GW/R3	101 - 111	3	02-Nov-00
AOC 3	MW-26D	MW-26D/GW/R3 & DUP11-3/GW/R3	106 - 116	3	03-Nov-00
AOC 3	MW-32D	MW-32D/GW/R3	99 - 109	3	21-Nov-00
AOC 3	MW-5B	MW-5B/GW/R3	100 - 110	3	31-Oct-00
AOC 3	MW-7B	MW-7B/GW/R3	62 - 72	3	25-Oct-00
AOC 3	S-11C	S-11C/GW/R3	105 - 115	3	02-Nov-00
AOC 3	S-2C	S-2C/GW/R3	98 - 108	3	01-Nov-00
AOC 3	S-3C	S-3C/GW/R3	90 - 100	3	01-Nov-00
AOC 3	MW-11B	MW-11B/GW/R4	132 - 142	4	02-May-01
AOC 3	MW-12B	MW-12B/GW/R4	133 - 143	4	02-May-01
AOC 3	MW-22D	MW-22D/GW/R4	125 - 135	4	03-May-01
AOC 3	MW-23D	MW-23D/GW/R4	101 - 111	4	04-May-01
AOC 3	MW-26D	MW-26D/GW/R4	106 - 116	4	04-May-01
AOC 3	MW-32D	MW-32D/GW/R4	99 - 109	4	03-May-01
AOC 3	MW-5B	MW-5B/GW/R4	100 - 110	4	02-May-01
AOC 3	S-11C	S-11C/GW/R4	105 - 115	4	04-May-01
AOC 4	MW-17D	MW-17D/R2/GW	139 - 149	2	04-Jan-00
AOC 4	MW-18D	MW-18D/R2/GW	134 - 144	2	06-Jan-00
AOC 4	MW-19D	MW-19D/R2/GW	134 - 144	2	06-Jan-00
AOC 4	MW-17D	MW-17D/GW/R3	139 - 149	3	30-Oct-00
AOC 4	MW-18D	MW-18D/GW/R3	134 - 144	3	27-Oct-00
AOC 4	MW-19D	MW-19D/GW/R3	134 - 144	3	26-Oct-00
AOC 4	MW-17D	MW-17D/GW/R4	139 - 149	4	02-May-01
AOC 4	MW-18D	MW18D/GW/R4/RE	134 - 144	4	11-Jun-01
AOC 4	MW-19D	MW-19D/GW/R4	134 - 144	4	01-May-01
BKGD	MW-8A	MW-8A/R2/GW	7 - 17	2	04-Jan-00
BKGD	MW-8B	MW-8B/R2/GW	92 - 102	2	04-Jan-00
BKGD	MW-8A	MW-8A/GW/R3	7 - 17	3	26-Oct-00
BKGD	MW-8B	MW-8B/GW/R3	92 - 102	3	26-Oct-00
BKGD	MW-8A	MW-8A/GW/R4	7 - 17	4	01-May-01
BKGD	MW-8B	MW-8B/GW/R4	92 - 102	4	01-May-01

Notes:
AOC - Area of Concern
BKGD - Site Background

800166

Table 2-1
Frequency of Detection
Soil and Sediment Data
BROS Human Health Risk Assessment
Bridgeport, NJ

			Soil												Sediment		
			AOC 1		AOC 2		AOC 3	AOC 4	AOC 5	AOC 6	AOC BP		Background		Cedar Swamp (CS H1B - Culvert to Tide Gate)	Little Timber Creek Swamp (H3: R130-R144)	Background
Analyte	Class	CASRN	Surface	Subsurface	Surface	Subsurface	Subsurface	Subsurface	Subsurface	Subsurface	Surface	Subsurface	Surface	Subsurface			
Aluminum	Metals	7429-90-5	1 / 1	3 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	4 / 4	5 / 5	20 / 20	5 / 5	16 / 16	NA	NA	10 / 10
Antimony	Metals	7440-36-0	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 20	0 / 5	0 / 16	NA	NA	0 / 10
Arsenic	Metals	7440-38-2	1 / 1	3 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	4 / 4	4 / 5	19 / 20	5 / 5	16 / 16	NA	NA	10 / 10
Barium	Metals	7440-39-3	1 / 1	3 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	4 / 4	5 / 5	20 / 20	5 / 5	16 / 16	NA	NA	10 / 10
Beryllium	Metals	7440-41-7	1 / 1	3 / 3	1 / 1	3 / 4	1 / 1	0 / 1	1 / 1	0 / 4	2 / 5	13 / 20	5 / 5	16 / 16	NA	NA	10 / 10
Cadmium	Metals	7440-43-9	0 / 1	0 / 3	1 / 1	2 / 4	0 / 1	0 / 1	1 / 1	0 / 4	1 / 4	5 / 17	2 / 4	5 / 14	2 / 4	5 / 7	6 / 11
Calcium	Metals	7440-70-2	1 / 1	3 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	4 / 4	5 / 5	20 / 20	5 / 5	16 / 16	NA	NA	10 / 10
Chromium	Metals	7440-47-3	1 / 1	4 / 4	1 / 1	5 / 5	1 / 1	1 / 1	1 / 1	4 / 4	5 / 5	21 / 21	5 / 5	16 / 16	4 / 4	7 / 7	10 / 10
Chromium (VI)	Metals	18540-29-9	NA	1 / 1	NA	1 / 1	NA	NA	NA	NA	NA	1 / 1	NA	NA	NA	NA	NA
Cobalt	Metals	7440-48-4	1 / 1	3 / 3	1 / 1	2 / 4	1 / 1	0 / 1	1 / 1	1 / 4	4 / 5	17 / 20	5 / 5	16 / 16	4 / 4	7 / 7	10 / 10
Copper	Metals	7440-50-8	1 / 1	3 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	4 / 4	5 / 5	20 / 20	5 / 5	16 / 16	4 / 4	7 / 7	10 / 10
Iron	Metals	7439-89-6	1 / 1	3 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	4 / 4	4 / 5	19 / 20	5 / 5	16 / 16	NA	NA	10 / 10
Lead	Metals	7439-92-1	1 / 1	3 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	4 / 4	5 / 5	19 / 19	5 / 5	16 / 16	11 / 11	7 / 7	10 / 10
Magnesium	Metals	7439-95-4	1 / 1	3 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	4 / 4	5 / 5	20 / 20	5 / 5	16 / 16	NA	NA	10 / 10
Manganese	Metals	7439-96-5	1 / 1	3 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	4 / 4	5 / 5	20 / 20	5 / 5	16 / 16	NA	NA	10 / 10
Mercury	Metals	7439-97-6	1 / 1	2 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	1 / 4	4 / 5	18 / 20	4 / 5	14 / 16	4 / 4	7 / 7	7 / 10
Nickel	Metals	7440-02-0	1 / 1	3 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	4 / 4	5 / 5	19 / 20	5 / 5	16 / 16	4 / 4	7 / 7	10 / 10
Potassium	Metals	7440-09-7	1 / 1	3 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	4 / 4	4 / 5	18 / 20	5 / 5	16 / 16	NA	NA	10 / 10
Selenium	Metals	7782-49-2	0 / 1	1 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	2 / 5	6 / 20	3 / 5	5 / 16	NA	NA	6 / 10
Silver	Metals	7440-22-4	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 20	0 / 5	0 / 16	NA	NA	0 / 10
Sodium	Metals	7440-23-5	1 / 1	3 / 3	1 / 1	4 / 4	0 / 1	0 / 1	1 / 1	2 / 4	1 / 5	14 / 20	3 / 5	10 / 16	NA	NA	10 / 10
Thallium	Metals	7440-28-0	1 / 1	2 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	1 / 4	1 / 5	8 / 20	2 / 5	5 / 16	NA	NA	4 / 10
Vanadium	Metals	7440-62-2	1 / 1	3 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	4 / 4	5 / 5	20 / 20	5 / 5	16 / 16	4 / 4	7 / 7	10 / 10
Zinc	Metals	7440-66-6	1 / 1	3 / 3	1 / 1	4 / 4	1 / 1	1 / 1	1 / 1	4 / 4	5 / 5	20 / 20	5 / 5	16 / 16	4 / 4	7 / 7	10 / 10
Aroclor-1016	PCBs	12674-11-2	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 17	0 / 9	0 / 7	0 / 10
Aroclor-1221	PCBs	11104-28-2	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 17	0 / 9	0 / 7	0 / 10
Aroclor-1232	PCBs	11141-16-5	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 17	0 / 9	0 / 7	0 / 10
Aroclor-1242	PCBs	53469-21-9	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 17	0 / 9	0 / 7	0 / 10
Aroclor-1248	PCBs	12672-29-6	0 / 1	1 / 3	0 / 1	3 / 4	0 / 1	0 / 1	0 / 1	4 / 4	1 / 5	6 / 21	0 / 5	0 / 17	1 / 9	3 / 7	2 / 10
Aroclor-1254	PCBs	11097-69-1	0 / 1	0 / 3	1 / 1	1 / 4	1 / 1	0 / 1	0 / 1	0 / 4	4 / 5	8 / 21	1 / 5	4 / 17	5 / 9	4 / 7	8 / 10
Aroclor-1260	PCBs	11096-82-5	1 / 1	3 / 3	1 / 1	4 / 4	0 / 1	1 / 1	1 / 1	4 / 4	5 / 5	20 / 21	2 / 5	3 / 17	7 / 9	6 / 7	9 / 10
Total PCBs	PCBs	1336-36-3	1 / 1	3 / 3	1 / 1	4 / 4	0 / 1	1 / 1	1 / 1	4 / 4	5 / 5	20 / 21	2 / 5	3 / 17	7 / 9	6 / 7	9 / 10
4,4'-DDD	Pesticides	72-54-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 / 1
4,4'-DDE	Pesticides	72-55-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 / 1
4,4'-DDT	Pesticides	50-29-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 / 1
Aldrin	Pesticides	309-00-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Alpha BHC	Pesticides	319-84-6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Alpha Chlordane	Pesticides	5103-71-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 / 1
Beta BHC	Pesticides	319-85-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Delta BHC	Pesticides	319-86-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Dieldrin	Pesticides	60-57-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Endosulfan I	Pesticides	959-98-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Endosulfan II	Pesticides	33213-65-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Endosulfan sulfate	Pesticides	1031-07-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Endrin	Pesticides	72-20-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Endrin aldehyde	Pesticides	7421-93-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Endrin ketone	Pesticides	53494-70-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Gamma BHC - Lindane	Pesticides	58-89-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Gamma Chlordane	Pesticides	5103-74-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Heptachlor	Pesticides	76-44-8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Heptachlor epoxide	Pesticides	1024-57-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Methoxychlor	Pesticides	72-43-5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1
Toxaphene	Pesticides	8001-35-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0 / 1

Table 2-1
Frequency of Detection
Soil and Sediment Data
BROS Human Health Risk Assessment
Bridgeport, NJ

			Soil												Sediment		
			AOC 1		AOC 2		AOC 3	AOC 4	AOC 5	AOC 6	AOC BP		Background		Cedar Swamp (CS H1B - Culvert to Tide Gate)	Little Timber Creek Swamp (H3: R130-R144)	Background
Analyte	Class	CASRN	Surface	Subsurface	Surface	Subsurface	Subsurface	Subsurface	Subsurface	Subsurface	Surface	Subsurface	Surface	Subsurface			
2,4,5-Trichlorophenol	SVOCs	95-95-4	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
2,4,6-Trichlorophenol	SVOCs	88-06-2	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
2,4-Dichlorophenol	SVOCs	120-83-2	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
2,4-Dimethylphenol	SVOCs	105-67-9	0 / 1	1 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	1 / 21	0 / 5	0 / 16	NA	NA	0 / 10
2,4-Dinitrophenol	SVOCs	51-28-5	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
2,4-Dinitrotoluene	SVOCs	121-14-2	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
2,6-Dinitrotoluene	SVOCs	606-20-2	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
2-Chloronaphthalene	SVOCs	91-58-7	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	NA	NA	NA	NA	0 / 10
2-Chlorophenol	SVOCs	95-57-8	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
2-Methylnaphthalene	SVOCs	91-57-6	0 / 1	1 / 3	0 / 1	2 / 4	1 / 1	0 / 1	0 / 1	4 / 4	0 / 5	6 / 21	NA	NA	NA	NA	1 / 10
2-Methylphenol	SVOCs	95-48-7	0 / 1	1 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
2-Nitroaniline	SVOCs	88-74-4	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
2-Nitrophenol	SVOCs	88-75-5	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
3,3'-Dichlorobenzidine	SVOCs	91-94-1	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
3-Nitroaniline	SVOCs	99-09-2	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
4,6-Dinitro-2-methylphenol	SVOCs	534-52-1	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
4-Bromophenyl phenyl ether	SVOCs	101-55-3	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
4-Chloro-3-methylphenol	SVOCs	59-50-7	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
4-Chloroaniline	SVOCs	106-47-8	0 / 1	0 / 3	0 / 1	0 / 2	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 20	0 / 5	0 / 16	NA	NA	0 / 10
4-Chlorophenyl phenyl ether	SVOCs	7005-72-3	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
4-Methyl-2-pentanone	SVOCs	108-10-1	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 3	0 / 13	NA	NA	0 / 10
4-Methylphenol	SVOCs	106-44-5	0 / 1	1 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	3 / 21	0 / 5	0 / 16	NA	NA	0 / 10
4-Nitroaniline	SVOCs	100-01-6	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
4-Nitrophenol	SVOCs	100-02-7	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Acenaphthene	SVOCs	83-32-9	0 / 1	1 / 3	0 / 1	2 / 4	1 / 1	0 / 1	0 / 1	3 / 4	0 / 5	5 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Acenaphthylene	SVOCs	208-96-8	0 / 1	1 / 3	0 / 1	3 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	2 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Anthracene	SVOCs	120-12-7	0 / 1	1 / 3	1 / 1	3 / 4	0 / 1	0 / 1	0 / 1	3 / 4	0 / 5	5 / 21	0 / 5	0 / 16	NA	NA	2 / 10
Benzaldehyde	SVOCs	100-52-7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 / 1
Benzo(a)anthracene	SVOCs	56-55-3	1 / 1	2 / 3	1 / 1	3 / 4	1 / 1	0 / 1	0 / 1	4 / 4	1 / 5	6 / 21	1 / 5	1 / 16	NA	NA	4 / 10
Benzo(a)pyrene	SVOCs	50-32-8	1 / 1	1 / 3	1 / 1	1 / 4	1 / 1	0 / 1	0 / 1	2 / 4	1 / 5	6 / 21	1 / 5	1 / 16	NA	NA	4 / 10
Benzo(b)fluoranthene	SVOCs	205-99-2	1 / 1	1 / 3	1 / 1	3 / 4	1 / 1	0 / 1	0 / 1	2 / 4	1 / 5	8 / 21	2 / 5	2 / 16	NA	NA	6 / 10
Benzo(g,h,i)perylene	SVOCs	191-24-2	1 / 1	1 / 3	1 / 1	2 / 4	1 / 1	0 / 1	0 / 1	1 / 4	1 / 5	6 / 21	1 / 5	1 / 16	NA	NA	4 / 10
Benzo(k)fluoranthene	SVOCs	207-08-9	1 / 1	1 / 3	1 / 1	1 / 4	0 / 1	0 / 1	0 / 1	0 / 4	1 / 5	4 / 21	1 / 5	1 / 16	NA	NA	4 / 11
bis(2-Chloroethoxy)methane	SVOCs	111-91-1	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
bis(2-Chloroethyl)ether	SVOCs	111-44-4	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
bis(2-Ethylhexyl)phthalate	SVOCs	117-81-7	1 / 1	2 / 3	0 / 1	2 / 4	0 / 1	0 / 1	1 / 1	4 / 4	1 / 5	6 / 21	1 / 5	4 / 16	NA	NA	8 / 10
Butyl benzyl phthalate	SVOCs	85-68-7	0 / 1	1 / 3	0 / 1	1 / 4	0 / 1	0 / 1	0 / 1	1 / 4	0 / 5	1 / 21	0 / 5	2 / 16	NA	NA	0 / 10
Carbazole	SVOCs	86-74-8	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Chrysene	SVOCs	218-01-9	1 / 1	2 / 3	1 / 1	3 / 4	1 / 1	0 / 1	0 / 1	3 / 4	1 / 5	8 / 21	1 / 5	1 / 16	NA	NA	6 / 10
Dibenzo(a,h)anthracene	SVOCs	53-70-3	0 / 1	0 / 3	1 / 1	1 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	2 / 10
Dibenzofuran	SVOCs	132-64-9	0 / 1	1 / 3	0 / 1	2 / 4	1 / 1	0 / 1	0 / 1	1 / 4	0 / 5	4 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Diethyl phthalate	SVOCs	84-66-2	0 / 1	0 / 3	0 / 1	2 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Dimethyl phthalate	SVOCs	131-11-3	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Di-n-butyl phthalate	SVOCs	84-74-2	0 / 1	0 / 3	0 / 1	2 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	1 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Di-n-octyl phthalate	SVOCs	117-84-0	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Fluoranthene	SVOCs	206-44-0	1 / 1	2 / 3	1 / 1	4 / 4	1 / 1	0 / 1	0 / 1	4 / 4	1 / 5	8 / 21	3 / 5	3 / 16	NA	NA	6 / 10
Fluorene	SVOCs	86-73-7	0 / 1	1 / 3	0 / 1	3 / 4	1 / 1	0 / 1	0 / 1	4 / 4	0 / 5	5 / 21	1 / 5	1 / 16	NA	NA	0 / 10
Hexachlorobenzene	SVOCs	118-74-1	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Hexachlorobutadiene	SVOCs	87-68-3	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Hexachlorocyclopentadiene	SVOCs	77-47-4	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Hexachloroethane	SVOCs	67-72-1	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10

Table 2-1
Frequency of Detection
Soil and Sediment Data
BROS Human Health Risk Assessment
Bridgeport, NJ

			Soil												Sediment		
			AOC 1		AOC 2		AOC 3	AOC 4	AOC 5	AOC 6	AOC BP		Background		Cedar Swamp	Little Timber Creek Swamp	Background
Analyte	Class	CASRN	Surface	Subsurface	Surface	Subsurface	Subsurface	Subsurface	Subsurface	Subsurface	Surface	Subsurface	Surface	Subsurface	(CS H1B - Culvert to Tide Gate)	(H3: R130-R144)	
Indeno(1,2,3-cd)pyrene	SVOCs	193-39-5	1 / 1	1 / 3	1 / 1	1 / 4	0 / 1	0 / 1	0 / 1	2 / 4	1 / 5	4 / 21	1 / 5	1 / 16	NA	NA	4 / 10
Isophorone	SVOCs	78-59-1	0 / 1	1 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Naphthalene	SVOCs	91-20-3	0 / 1	1 / 3	0 / 1	2 / 4	1 / 1	0 / 1	0 / 1	4 / 4	0 / 5	4 / 21	0 / 5	0 / 16	NA	NA	2 / 10
Nitrobenzene	SVOCs	98-95-3	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
n-Nitrosodiphenylamine	SVOCs	86-30-6	0 / 1	1 / 3	0 / 1	2 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
n-Nitrosodipropylamine	SVOCs	621-64-7	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Pentachlorophenol	SVOCs	87-86-5	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Phenanthrene	SVOCs	85-01-8	1 / 1	2 / 3	1 / 1	4 / 4	1 / 1	0 / 1	0 / 1	4 / 4	1 / 5	7 / 21	1 / 5	1 / 16	NA	NA	5 / 10
Phenol	SVOCs	108-95-2	0 / 1	1 / 3	0 / 1	1 / 4	0 / 1	0 / 1	0 / 1	0 / 4	0 / 5	2 / 21	0 / 5	0 / 16	NA	NA	0 / 10
Pyrene	SVOCs	129-00-0	1 / 1	2 / 3	1 / 1	4 / 4	1 / 1	1 / 1	0 / 1	4 / 4	1 / 5	10 / 21	2 / 5	2 / 16	NA	NA	6 / 10
1,1,1-Trichloroethane	VOCs	71-55-6	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	14 / 14	NA	NA	0 / 10
1,1,2,2-Tetrachloroethane	VOCs	79-34-5	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
1,1,2-Trichloroethane	VOCs	79-00-5	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
1,1-Dichloroethane	VOCs	75-34-3	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
1,1-Dichloroethene	VOCs	75-35-4	NA	NA	NA	NA	NA	0 / 1	NA	NA	NA	NA	0 / 4	0 / 14	NA	NA	NA
1,1-Dichloroethene	VOCs	75-35-4	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 9	0 / 4	0 / 14	NA	NA	0 / 10
1,2,4-Trichlorobenzene	VOCs	120-82-1	0 / 1	1 / 3	0 / 1	2 / 4	0 / 1	0 / 1	0 / 1	4 / 4	0 / 5	3 / 21	0 / 5	0 / 16	NA	NA	0 / 10
1,2-Dichlorobenzene	VOCs	95-50-1	NA	NA	NA	NA	0 / 1	0 / 1	0 / 1	3 / 4	0 / 5	2 / 21	0 / 5	0 / 16	NA	NA	0 / 10
1,2-Dichlorobenzene	VOCs	95-50-1	0 / 1	1 / 3	0 / 1	3 / 4	NA	NA	NA	NA	NA	NA	0 / 5	0 / 16	NA	NA	NA
1,2-Dichloroethane	VOCs	107-06-2	NA	NA	NA	NA	0 / 1	0 / 1	0 / 1	0 / 2	0 / 3	0 / 9	0 / 4	0 / 14	NA	NA	0 / 10
1,2-Dichloropropane	VOCs	78-87-5	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
1,3-Dichlorobenzene	VOCs	541-73-1	0 / 1	0 / 3	0 / 1	0 / 4	0 / 1	0 / 1	0 / 1	3 / 4	0 / 5	0 / 21	0 / 5	0 / 16	NA	NA	0 / 10
1,4-Dichlorobenzene	VOCs	106-46-7	0 / 1	1 / 3	0 / 1	2 / 4	0 / 1	0 / 1	0 / 1	2 / 4	0 / 5	1 / 21	0 / 5	0 / 16	NA	NA	0 / 10
2-Butanone	VOCs	78-93-3	NA	NA	NA	NA	0 / 1	0 / 1	0 / 1	0 / 2	0 / 3	2 / 9	0 / 4	0 / 14	NA	NA	3 / 10
2-Hexanone	VOCs	591-78-6	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 3	0 / 13	NA	NA	0 / 10
Acetone	VOCs	67-64-1	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	3 / 8	1 / 4	1 / 14	NA	NA	10 / 10
Benzene	VOCs	71-43-2	NA	NA	NA	NA	0 / 1	0 / 1	0 / 1	0 / 2	0 / 3	2 / 9	0 / 4	0 / 14	NA	NA	0 / 10
Bromodichloromethane	VOCs	75-27-4	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
Bromoform	VOCs	75-25-2	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
Bromomethane/ Methyl bromi	VOCs	74-83-9	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
Carbon disulfide	VOCs	75-15-0	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	1 / 8	0 / 4	0 / 14	NA	NA	10 / 10
Carbon tetrachloride	VOCs	56-23-5	NA	NA	NA	NA	0 / 1	0 / 1	0 / 1	0 / 2	0 / 3	0 / 9	0 / 4	0 / 14	NA	NA	0 / 10
Chlorobenzene	VOCs	108-90-7	NA	NA	NA	NA	0 / 1	0 / 1	0 / 1	0 / 2	0 / 3	3 / 9	0 / 4	0 / 14	NA	NA	0 / 10
Chloroethane	VOCs	75-00-3	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
Chloroform	VOCs	67-66-3	NA	NA	NA	NA	0 / 1	0 / 1	0 / 1	0 / 2	0 / 3	1 / 9	1 / 4	1 / 14	NA	NA	0 / 10
Chloromethane	VOCs	74-87-3	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
cis-1,2-Dichloroethene	VOCs	156-59-2	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	1 / 8	0 / 4	0 / 14	NA	NA	0 / 10
cis-1,3-Dichloropropene	VOCs	10061-01-5	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
Dibromochloromethane	VOCs	124-48-1	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
Ethylbenzene	VOCs	100-41-4	NA	NA	NA	NA	0 / 1	NA	0 / 1	2 / 2	0 / 3	3 / 8	0 / 4	0 / 14	NA	NA	0 / 10
Methylene chloride	VOCs	75-09-2	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	1 / 8	3 / 4	10 / 14	NA	NA	9 / 10
Styrene	VOCs	100-42-5	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
Tetrachloroethene	VOCs	127-18-4	NA	NA	NA	NA	0 / 1	0 / 1	0 / 1	1 / 2	0 / 3	1 / 9	0 / 4	0 / 14	NA	NA	0 / 10
Toluene	VOCs	108-88-3	NA	NA	NA	NA	0 / 1	NA	0 / 1	2 / 2	0 / 3	3 / 8	0 / 4	1 / 14	NA	NA	6 / 10
trans-1,2-Dichloroethene	VOCs	156-60-5	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
trans-1,3-Dichloropropene	VOCs	10061-02-6	NA	NA	NA	NA	0 / 1	NA	0 / 1	0 / 2	0 / 3	0 / 8	0 / 4	0 / 14	NA	NA	0 / 10
Trichloroethene	VOCs	79-01-6	NA	NA	NA	NA	0 / 1	0 / 1	0 / 1	0 / 2	0 / 3	1 / 9	0 / 4	0 / 14	NA	NA	0 / 10
Vinyl chloride	VOCs	75-01-4	NA	NA	NA	NA	0 / 1	0 / 1	0 / 1	0 / 2	0 / 3	0 / 9	0 / 4	0 / 14	NA	NA	0 / 10
Xylenes (Total)	VOCs	1330-20-7	NA	NA	NA	NA	1 / 1	NA	1 / 1	2 / 2	0 / 3	3 / 8	0 / 4	0 / 14	NA	NA	0 / 10

NA - Not analyzed
Surface: Samples collected with Bottom depth ≤ 0.5 feet
Subsurface: Samples collected with Bottom depth < 6 feet (< 7 for AOC 6 for data robustness)

800169

Table 2-2
Frequency of Detection
Ground water and Surface Water Data
BROS Human Health Risk Assessment
Bridgeport, NJ

Analyte	Class	CASRN	Groundwater						Surface Water			
			AOC 1a	AOC 1b	AOC 1c	AOC 3	AOC 4	Background	Cedar Swamp (CS H1B - Culvert to Tide Gate)	Cedar Swamp Background	Little Timber Creek Swamp (H3: R130-R144)	Little Timber Creek Swamp Background
Aluminum	Metals	7429-90-5	16 / 19	1 / 1	1 / 2	19 / 21	2 / 6	3 / 4	2 / 2	2 / 2	2 / 3	4 / 5
Antimony	Metals	7440-36-0	0 / 17	0 / 1	0 / 1	0 / 13	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Arsenic	Metals	7440-38-2	9 / 17	0 / 1	1 / 1	5 / 13	1 / 3	0 / 2	0 / 2	0 / 2	0 / 3	4 / 5
Barium	Metals	7440-39-3	17 / 17	1 / 1	1 / 1	13 / 13	3 / 3	2 / 2	2 / 2	2 / 2	3 / 3	5 / 5
Beryllium	Metals	7440-41-7	4 / 17	0 / 1	0 / 1	8 / 13	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Cadmium	Metals	7440-43-9	0 / 17	0 / 1	0 / 1	0 / 13	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Calcium	Metals	7440-70-2	17 / 17	1 / 1	1 / 1	13 / 13	3 / 3	2 / 2	2 / 2	2 / 2	3 / 3	5 / 5
Chromium	Metals	7440-47-3	6 / 17	0 / 1	0 / 1	6 / 13	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	1 / 5
Cobalt	Metals	7440-48-4	5 / 17	0 / 1	1 / 1	13 / 13	3 / 3	0 / 2	0 / 2	0 / 2	0 / 3	2 / 5
Copper	Metals	7440-50-8	5 / 17	0 / 1	1 / 1	8 / 12	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	2 / 5
Iron	Metals	7439-89-6	16 / 16	1 / 1	2 / 2	27 / 27	7 / 7	4 / 5	2 / 2	2 / 2	3 / 3	5 / 5
Lead	Metals	7439-92-1	6 / 17	0 / 1	0 / 1	5 / 13	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	2 / 5
Magnesium	Metals	7439-95-4	17 / 17	1 / 1	1 / 1	13 / 13	3 / 3	2 / 2	2 / 2	2 / 2	3 / 3	5 / 5
Manganese	Metals	7439-96-5	19 / 19	1 / 1	2 / 2	29 / 29	7 / 7	5 / 5	2 / 2	2 / 2	3 / 3	5 / 5
Mercury	Metals	7439-97-6	1 / 17	0 / 1	0 / 1	0 / 13	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Nickel	Metals	7440-02-0	7 / 17	1 / 1	0 / 1	13 / 13	3 / 3	0 / 2	0 / 2	0 / 2	0 / 3	2 / 5
Potassium	Metals	7440-09-7	17 / 17	1 / 1	1 / 1	13 / 13	3 / 3	2 / 2	2 / 2	2 / 2	3 / 3	5 / 5
Selenium	Metals	7782-49-2	3 / 17	0 / 1	0 / 1	4 / 13	0 / 3	0 / 2	0 / 2	1 / 2	0 / 3	1 / 5
Silver	Metals	7440-22-4	0 / 17	0 / 1	0 / 1	0 / 13	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Sodium	Metals	7440-23-5	17 / 17	1 / 1	1 / 1	12 / 12	2 / 2	NA	2 / 2	2 / 2	3 / 3	5 / 5
Thallium	Metals	7440-28-0	3 / 17	1 / 1	0 / 1	4 / 13	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	3 / 5
Vanadium	Metals	7440-62-2	9 / 17	0 / 1	1 / 1	10 / 13	3 / 3	0 / 2	0 / 2	2 / 2	0 / 3	3 / 5
Zinc	Metals	7440-66-6	15 / 17	1 / 1	1 / 1	13 / 13	2 / 2	NA	2 / 2	2 / 2	3 / 3	5 / 5
Aroclor-1016	PCBs	12674-11-2	0 / 4	NA	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
Aroclor-1221	PCBs	11104-28-2	0 / 4	NA	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
Aroclor-1232	PCBs	11141-16-5	0 / 4	NA	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
Aroclor-1242	PCBs	53469-21-9	4 / 4	NA	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
Aroclor-1248	PCBs	12672-29-6	0 / 4	NA	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
Aroclor-1254	PCBs	11097-69-1	0 / 4	NA	NA	NA	NA	NA	2 / 2	0 / 2	3 / 3	2 / 5
Aroclor-1260	PCBs	11096-82-5	4 / 4	NA	NA	NA	NA	NA	1 / 2	0 / 2	2 / 3	0 / 5
Total PCBs	PCBs	1336-36-3	4 / 4	NA	NA	NA	NA	NA	1 / 2	0 / 2	2 / 3	0 / 5
2,4,5-Trichlorophenol	SVOCs	95-95-4	0 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
2,4,6-Trichlorophenol	SVOCs	88-06-2	0 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
2,4-Dichlorophenol	SVOCs	120-83-2	0 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
2,4-Dimethylphenol	SVOCs	105-67-9	2 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
2,4-Dinitrophenol	SVOCs	51-28-5	0 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
2,4-Dinitrotoluene	SVOCs	121-14-2	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
2,6-Dinitrotoluene	SVOCs	606-20-2	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
2-Chloronaphthalene	SVOCs	91-58-7	NA	0 / 1	NA	0 / 11	0 / 3	NA	0 / 2	0 / 2	0 / 3	0 / 5

800170

Table 2-2
Frequency of Detection
Ground water and Surface Water Data
BROS Human Health Risk Assessment
Bridgeport, NJ

			Groundwater						Surface Water			
Analyte	Class	CASRN	AOC 1a	AOC 1b	AOC 1c	AOC 3	AOC 4	Background	Cedar Swamp (CS H1B - Culvert to Tide Gate)	Cedar Swamp Background	Little Timber Creek Swamp (H3: R130-R144)	Little Timber Creek Swamp Background
2-Chlorophenol	SVOCs	95-57-8	0 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
2-Methylnaphthalene	SVOCs	91-57-6	NA	0 / 1	NA	3 / 11	0 / 3	NA	0 / 2	0 / 2	0 / 3	0 / 5
2-Methylphenol	SVOCs	95-48-7	1 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
2-Nitroaniline	SVOCs	88-74-4	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
2-Nitrophenol	SVOCs	88-75-5	0 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
3,3'-Dichlorobenzidine	SVOCs	91-94-1	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
3-Nitroaniline	SVOCs	99-09-2	2 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
4,6-Dinitro-2-methylphenol	SVOCs	534-52-1	0 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
4-Bromophenyl phenyl ether	SVOCs	101-55-3	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
4-Chloro-3-methylphenol	SVOCs	59-50-7	1 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
4-Chloroaniline	SVOCs	106-47-8	1 / 14	0 / 1	0 / 1	3 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
4-Chlorophenyl phenyl ether	SVOCs	7005-72-3	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
4-Methyl-2-pentanone	SVOCs	108-10-1	3 / 20	0 / 1	0 / 3	11 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
4-Methylphenol	SVOCs	106-44-5	1 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	2 / 5
4-Nitroaniline	SVOCs	100-01-6	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
4-Nitrophenol	SVOCs	100-02-7	0 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
Acenaphthene	SVOCs	83-32-9	5 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Acenaphthylene	SVOCs	208-96-8	1 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Anthracene	SVOCs	120-12-7	1 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Benzo(a)anthracene	SVOCs	56-55-3	1 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Benzo(a)pyrene	SVOCs	50-32-8	1 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Benzo(b)fluoranthene	SVOCs	205-99-2	1 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Benzo(g,h,i)perylene	SVOCs	191-24-2	1 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Benzo(k)fluoranthene	SVOCs	207-08-9	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
bis(2-Chloroethoxy)methane	SVOCs	111-91-1	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
bis(2-Chloroethyl)ether	SVOCs	111-44-4	6 / 14	0 / 1	0 / 1	11 / 11	3 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
bis(2-Ethylhexyl)phthalate	SVOCs	117-81-7	6 / 14	0 / 1	0 / 1	1 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	1 / 5
Butyl benzyl phthalate	SVOCs	85-68-7	2 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Carbazole	SVOCs	86-74-8	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Chrysene	SVOCs	218-01-9	2 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Dibenzo(a,h)anthracene	SVOCs	53-70-3	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Dibenzofuran	SVOCs	132-64-9	2 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Diethyl phthalate	SVOCs	84-66-2	1 / 14	0 / 1	0 / 1	4 / 11	1 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Dimethyl phthalate	SVOCs	131-11-3	0 / 14	0 / 1	0 / 1	1 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Di-n-butyl phthalate	SVOCs	84-74-2	1 / 14	0 / 1	0 / 1	1 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Di-n-octyl phthalate	SVOCs	117-84-0	1 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5

800171

Table 2-2
Frequency of Detection
Ground water and Surface Water Data
BROS Human Health Risk Assessment
Bridgeport, NJ

			Groundwater						Surface Water			
Analyte	Class	CASRN	AOC 1a	AOC 1b	AOC 1c	AOC 3	AOC 4	Background	Cedar Swamp (CS H1B - Culvert to Tide Gate)	Cedar Swamp Background	Little Timber Creek Swamp (H3: R130-R144)	Little Timber Creek Swamp Background
Fluoranthene	SVOCs	206-44-0	3 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Fluorene	SVOCs	86-73-7	6 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Hexachlorobenzene	SVOCs	118-74-1	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Hexachlorobutadiene	SVOCs	87-68-3	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Hexachlorocyclopentadiene	SVOCs	77-47-4	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Hexachloroethane	SVOCs	67-72-1	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Indeno(1,2,3-cd)pyrene	SVOCs	193-39-5	1 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Isophorone	SVOCs	78-59-1	2 / 14	0 / 1	0 / 1	7 / 11	1 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Naphthalene	SVOCs	91-20-3	3 / 13	0 / 1	0 / 1	5 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Nitrobenzene	SVOCs	98-95-3	0 / 14	0 / 1	0 / 1	1 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
n-Nitrosodiphenylamine	SVOCs	86-30-6	4 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
n-Nitrosodipropylamine	SVOCs	621-64-7	0 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
Pentachlorophenol	SVOCs	87-86-5	0 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
Phenanthrene	SVOCs	85-01-8	4 / 14	0 / 1	0 / 1	1 / 11	0 / 3	0 / 2	1 / 2	0 / 2	1 / 3	0 / 5
Phenol	SVOCs	108-95-2	1 / 4	0 / 1	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	1 / 5
Pyrene	SVOCs	129-00-0	4 / 14	0 / 1	0 / 1	0 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
1,1,1-Trichloroethane	VOCs	71-55-6	3 / 20	0 / 1	0 / 3	9 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
1,1,2,2-Tetrachloroethane	VOCs	79-34-5	0 / 20	0 / 1	0 / 3	14 / 31	4 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
1,1,2-Trichloroethane	VOCs	79-00-5	1 / 20	0 / 1	0 / 3	13 / 31	3 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
1,1-Dichloroethane	VOCs	75-34-3	5 / 20	0 / 1	0 / 3	27 / 31	5 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
1,1-Dichloroethene	VOCs	75-35-4	1 / 20	NA	0 / 3	NA	NA	0 / 6	NA	NA	NA	NA
1,1-Dichloroethene	VOCs	75-35-4	1 / 20	0 / 1	0 / 3	20 / 31	3 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
1,2,4-Trichlorobenzene	VOCs	120-82-1	6 / 14	0 / 1	0 / 1	1 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
1,2-Dichlorobenzene	VOCs	95-50-1	7 / 14	0 / 1	0 / 1	7 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
1,2-Dichlorobenzene	VOCs	95-50-1	7 / 14	NA	0 / 1	NA	NA	0 / 2	NA	NA	NA	NA
1,2-Dichloroethane	VOCs	107-06-2	5 / 20	0 / 1	0 / 3	28 / 31	6 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
1,2-Dichloropropane	VOCs	78-87-5	2 / 20	0 / 1	0 / 3	13 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
1,3-Dichlorobenzene	VOCs	541-73-1	1 / 14	0 / 1	0 / 1	1 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
1,4-Dichlorobenzene	VOCs	106-46-7	3 / 14	0 / 1	0 / 1	4 / 11	0 / 3	0 / 2	0 / 2	0 / 2	0 / 3	0 / 5
2,2'-oxybis(1-Chloropropane)	VOCs	108-60-1	NA	NA	NA	NA	NA	NA	0 / 2	0 / 2	0 / 3	0 / 5
2-Butanone	VOCs	78-93-3	4 / 20	0 / 1	0 / 3	12 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
2-Hexanone	VOCs	591-78-6	2 / 20	0 / 1	0 / 3	3 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Acetone	VOCs	67-64-1	7 / 20	0 / 1	0 / 3	15 / 31	1 / 9	0 / 6	1 / 2	0 / 2	0 / 3	1 / 5
Benzene	VOCs	71-43-2	14 / 20	0 / 1	0 / 3	31 / 31	7 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Bromodichloromethane	VOCs	75-27-4	0 / 20	0 / 1	0 / 3	0 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5

800172

Table 2-2
Frequency of Detection
Ground water and Surface Water Data
BROS Human Health Risk Assessment
Bridgeport, NJ

			Groundwater						Surface Water			
Analyte	Class	CASRN	AOC 1a	AOC 1b	AOC 1c	AOC 3	AOC 4	Background	Cedar Swamp (CS H1B - Culvert to Tide Gate)	Cedar Swamp Background	Little Timber Creek Swamp (H3: R130-R144)	Little Timber Creek Swamp Background
Bromoform	VOCs	75-25-2	0 / 20	0 / 1	0 / 3	0 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Bromomethane/ Methyl bromid	VOCs	74-83-9	0 / 20	0 / 1	0 / 3	0 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Carbon disulfide	VOCs	75-15-0	2 / 20	0 / 1	0 / 3	11 / 31	3 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Carbon tetrachloride	VOCs	56-23-5	0 / 20	0 / 1	0 / 3	0 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Chlorobenzene	VOCs	108-90-7	3 / 20	0 / 1	0 / 3	21 / 31	1 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Chloroethane	VOCs	75-00-3	3 / 20	0 / 1	0 / 3	5 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Chloroform	VOCs	67-66-3	3 / 20	0 / 1	0 / 3	12 / 31	3 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Chloromethane	VOCs	74-87-3	1 / 20	0 / 1	0 / 3	1 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
cis-1,2-Dichloroethene	VOCs	156-59-2	6 / 20	0 / 1	0 / 3	29 / 31	6 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
cis-1,3-Dichloropropene	VOCs	10061-01-5	0 / 20	0 / 1	0 / 3	0 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Dibromochloromethane	VOCs	124-48-1	0 / 20	0 / 1	0 / 3	0 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Ethylbenzene	VOCs	100-41-4	9 / 20	0 / 1	0 / 3	18 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Methylene chloride	VOCs	75-09-2	2 / 20	0 / 1	0 / 3	13 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Styrene	VOCs	100-42-5	0 / 20	0 / 1	0 / 3	1 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Tetrachloroethene	VOCs	127-18-4	4 / 20	0 / 1	0 / 3	22 / 31	3 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Toluene	VOCs	108-88-3	8 / 20	0 / 1	0 / 3	15 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	2 / 5
trans-1,2-Dichloroethene	VOCs	156-60-5	2 / 20	0 / 1	0 / 3	13 / 31	2 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
trans-1,3-Dichloropropene	VOCs	10061-02-6	0 / 20	0 / 1	0 / 3	0 / 31	0 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Trichloroethene	VOCs	79-01-6	4 / 20	0 / 1	0 / 3	27 / 31	6 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Vinyl chloride	VOCs	75-01-4	4 / 20	0 / 1	0 / 3	26 / 31	3 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5
Xylenes (Total)	VOCs	1330-20-7	12 / 20	0 / 1	0 / 3	18 / 31	3 / 9	0 / 6	1 / 2	0 / 2	0 / 3	0 / 5

NA - Not analyzed

800173

Table 2-3
Selection of Chemicals of Potential Concern
AOC 1: Soil-surface 0-6in (Residential)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-surface 0-6in (Residential)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC 1	**Metals**																
	7429-90-5	Aluminum	10300	10300	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	10300	5610	7821.43	N	7614.20	N	Reg IX PRG (res)	Y	ASL
	7440-38-2	Arsenic	7.7	7.7	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	7.7	13.80	0.43	C	0.39	C	Reg IX PRG (res)	Y	ASL
	7440-39-3	Barium	48.4	48.4	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	48.4	36.60	547.5	N	537.49	N	Reg IX PRG (res)	N	BSL
	7440-41-7	Beryllium	0.53 B	0.53 B	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.53	0.83	15.64	N	15.44	N	Reg IX PRG (res)	N	BSL
	7440-70-2	Calcium	1800	1800	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	1800	216	NV		NV			N	NUT
	7440-47-3	Chromium	31.5	31.5	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	31.5	50.80	2.35	N	210.68	C	Reg IX PRG (res)	Y	ASL
	7440-48-4	Cobalt	6.9	6.9	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	6.9	4.10	156.43	N	902.89	C	Reg IX PRG (res)	N	BSL
	7440-50-8	Copper	11.6	11.6	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	11.6	10	312.86	N	312.86	N	Reg IX PRG (res)	N	BSL
	7439-89-6	Iron	20800	20800	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	20800	30200	2346.43	N	2346.32	N	Reg IX PRG (res)	Y	ASL
	7439-92-1	Lead	30.4	30.4	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	30.4	50.40	NV		40	N	Reg IX PRG (res)	N	BSL
	7439-95-4	Magnesium	3280 NJ	3280 NJ	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	3280	868	NV		NV			N	NUT
	7439-96-5	Manganese	530	530	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	530	76.90	156.43	N	176.24	N	Reg IX PRG (res)	Y	ASL
	7439-97-6	Mercury	0.091 B	0.091 B	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.091	0.087	0.08	N	0.06	N	Reg IX PRG (res)	Y	ASL
	7440-02-0	Nickel	14.7	14.7	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	14.7	11.30	156.43	N	156.43	N	Reg IX PRG (res)	N	BSL
	7440-09-7	Potassium	1780 J	1780 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	1780	2400	NV		NV			N	NUT
	7440-23-5	Sodium	182	182	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	182	118	NV		NV			N	NUT
	7440-28-0	Thallium	1.3 B	1.3 B	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	1.3	1.5	0.5475	N	0.52	N	Reg IX PRG (res)	Y	ASL
	7440-62-2	Vanadium	28.3	28.3	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	28.3	61.20	54.75	N	54.75	N	Reg IX PRG (res)	N	BSL
	7440-66-6	Zinc	68.4	68.4	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	68.4	31.30	2346.43	N	2346.32	N	Reg IX PRG (res)	N	BSL

800174

Table 2-3
Selection of Chemicals of Potential Concern
AOC 1: Soil-surface 0-6in (Residential)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-surface 0-6in (Residential)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	SVOCs																
	56-55-3	Benzo(a)anthracene	0.089 J	0.089 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.089	0.07	0.87	C	0.62	C	Reg IX PRG (res)	N	BSL
	50-32-8	Benzo(a)pyrene	0.077 J	0.077 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.077	0.05							
	205-99-2	Benzo(b)fluoranthene	0.11 J	0.11 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.11	0.11	0.87	C	0.62	C	Reg IX PRG (res)	N	BSL
	191-24-2	Benzo(g,h,i)perylene	0.046 J	0.046 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.046	0.046	NV		NV			Y	NV
	207-08-9	Benzo(k)fluoranthene	0.049 J	0.049 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.049	0.038	8.75	C	6.21	C	Reg IX PRG (res)	N	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	0.13 J	0.13 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.13	0.18	45.62	C	34.74	C	Reg IX PRG (res)	N	BSL
	218-01-9	Chrysene	0.079 J	0.079 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.079	0.082	87.50	C	62.15	C	Reg IX PRG (res)	N	BSL
	206-44-0	Fluoranthene	0.11 J	0.11 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.11	0.11	312.86	N	229.36	N	Reg IX PRG (res)	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.05 J	0.05 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.05	0.05	0.87	C	0.62	C	Reg IX PRG (res)	N	BSL
	85-01-8	Phenanthrene	0.051 J	0.051 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.051	0.089	NV		NV			Y	NV
	129-00-0	Pyrene	0.088 J	0.088 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.088	0.11	234.64	N	231.60	N	Reg IX PRG (res)	N	BSL
	PCBs																
	1336-36-3	Total PCBs	0.062	0.062	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.062	0.0076	0.32	C	0.22	C	Reg IX PRG (res)	N	BSL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Residential Region III Soil RBCs . HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800175

Table 2-4
Selection of Chemicals of Potential Concern
AOC 1: Soil-surface 0-6in (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-surface 0-6in (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC 1	Metals																
	7429-90-5	Aluminum	10300	10300	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	10300	5610	102200	N	10000	max	Reg IX PRG (ind)	Y	AARAR
	7440-38-2	Arsenic	7.7	7.7	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	7.7	13.80	1.91	C	1.59	C	Reg IX PRG (ind)	Y	ASL
	7440-39-3	Barium	48.4	48.4	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	48.4	36.60	7154	N	6657.73	N	Reg IX PRG (ind)	N	BSL
	7440-41-7	Beryllium	0.53 B	0.53 B	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.53	0.83	204.40	N	1940.69	C	Reg IX PRG (ind)	N	BSL
	7440-70-2	Calcium	1800	1800	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	1800	216	NV		NV			N	NUT
	7440-47-3	Chromium	31.5	31.5	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	31.5	50.80	30.66	N	448.32	C	Reg IX PRG (ind)	Y	ASL
	7440-48-4	Cobalt	6.9	6.9	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	6.9	4.10	2044	N	1921.35	C	Reg IX PRG (ind)	N	BSL
	7440-50-8	Copper	11.6	11.6	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	11.6	10	4088	N	4087.67	N	Reg IX PRG (ind)	N	BSL
	7439-89-6	Iron	20800	20800	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	20800	30200	30660	N	10000	max	Reg IX PRG (ind)	Y	AARAR
	7439-92-1	Lead	30.4	30.4	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	30.4	50.40	NV		75	N	Reg IX PRG (ind)	N	BSL
	7439-95-4	Magnesium	3280 NJ	3280 NJ	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	3280	868	NV		NV			N	NUT
	7439-96-5	Manganese	530	530	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	530	76.90	2044	N	1945.81	N	Reg IX PRG (ind)	N	BSL
	7439-97-6	Mercury	0.091 B	0.091 B	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.091	0.087	1.02	N	0.62	N	Reg IX PRG (ind)	N	BSL
	7440-02-0	Nickel	14.7	14.7	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	14.7	11.30	2044	N	2043.92	N	Reg IX PRG (ind)	N	BSL
	7440-09-7	Potassium	1780 J	1780 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	1780	2400	NV		NV			N	NUT
	7440-23-5	Sodium	182	182	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	182	118	NV		NV			N	NUT
	7440-28-0	Thallium	1.3 B	1.3 B	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	1.3	1.5	7.154	N	6.75	N	Reg IX PRG (ind)	N	BSL
	7440-62-2	Vanadium	28.3	28.3	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	28.3	61.20	715.4	N	715.39	N	Reg IX PRG (ind)	N	BSL
	7440-66-6	Zinc	68.4	68.4	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	68.4	31.30	30660	N	10000	max	Reg IX PRG (ind)	N	BSL

800176

Table 2-4
Selection of Chemicals of Potential Concern
AOC 1: Soil-surface 0-6in (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-surface 0-6in (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	SVOCs																
	56-55-3	Benzo(a)anthracene	0.089 J	0.089 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.089	0.07	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	50-32-8	Benzo(a)pyrene	0.077 J	0.077 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.077	0.05	0.392	C	0.21	C	Reg IX PRG (ind)	N	BSL
	205-99-2	*Benzo(b)fluoranthene*	0.11 J	0.11 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.11	0.11	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	191-24-2	Benzo(g,h,i)perylene	0.046 J	0.046 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.046	0.046	NV		NV			Y	NV
	207-08-9	Benzo(k)fluoranthene	0.049 J	0.049 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.049	0.038	39.20	C	21.10	C	Reg IX PRG (ind)	N	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	0.13 J	0.13 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.13	0.18	204.40	C	123.12	C	Reg IX PRG (ind)	N	BSL
	218-01-9	Chrysene	0.079 J	0.079 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.079	0.082	392	C	210.96	C	Reg IX PRG (ind)	N	BSL
	206-44-0	Fluoranthene	0.11 J	0.11 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.11	0.11	4088	N	2200.04	N	Reg IX PRG (ind)	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.05 J	0.05 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.05	0.05	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	85-01-8	Phenanthrene	0.051 J	0.051 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.051	0.089	NV		NV			Y	NV
	129-00-0	Pyrene	0.088 J	0.088 J	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.088	0.11	3066	N	2912.62	N	Reg IX PRG (ind)	N	BSL
	PCBs																
	1336-36-3	Total PCBs	0.062	0.062	mg/kg	P-36_08/17/1999_0_0.17	1/1	NA	0.062	0.0076	1.43	C	0.74	C	Reg IX PRG (ind)	N	BSL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Industrial Region III Soil RBCs . HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800177

Table 2-5
Selection of Chemicals of Potential Concern
AOC 1: Soil-subsurface 0-6ft (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-subsurface 0-6ft (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC 1	**Metals**																
	7429-90-5	Aluminum	5510	12200	mg/kg	P-36_08/17/1999_0.17_1	3/3	NA	12200	8450	102200	N	10000	max	Reg IX PRG (ind)	Y	AARAR
	7440-38-2	Arsenic	3.7	20	mg/kg	P-36_08/17/1999_0.17_1	3/3	NA	20	13.80	1.91	C	1.59	C	Reg IX PRG (ind)	Y	ASL
	7440-39-3	Barium	30.9	265	mg/kg	P-36_08/17/1999_0.17_1	3/3	NA	265	138	7154	N	6657.73	N	Reg IX PRG (ind)	N	BSL
	7440-41-7	Beryllium	0.19 B	1.3	mg/kg	P-36_08/17/1999_0.17_1	3/3	NA	1.3	1.40	204.4	N	1940.69	C	Reg IX PRG (ind)	N	BSL
	7440-70-2	Calcium	89.8	1800	mg/kg	P-36_08/17/1999_0_0.17	3/3	NA	1800	3090	NV		NV			N	NUT
	7440-47-3	Chromium	29.3	140	mg/kg	P-36_08/17/1999_0.17_1	4/4	NA	140	50.80	30.66	N	448.32	C	Reg IX PRG (ind)	Y	ASL
	18540-29-9	Chromium (hexavalent)	1.6	1.6	mg/kg	P-36_09/12/2000_0_1	1/1	NA	1.6	NA	306.6	N	64.05	C	Reg IX PRG (ind)	N	BSL
	7440-48-4	Cobalt	1.7 B	6.9	mg/kg	P-36_08/17/1999_0_0.17	3/3	NA	6.9	5.90	2044	N	1921.35	C	Reg IX PRG (ind)	N	BSL
	7440-50-8	Copper	4.3 B	11.6	mg/kg	P-36_08/17/1999_0_0.17	3/3	NA	11.6	10.10	4088	N	4087.67	N	Reg IX PRG (ind)	N	BSL
	7439-89-6	Iron	9000	29100	mg/kg	P-36_08/17/1999_0.17_1	3/3	NA	29100	30200	30660	N	10000	max	Reg IX PRG (ind)	Y	AARAR
	7439-92-1	Lead	5.9	537	mg/kg	P-36_08/17/1999_4_5	3/3	NA	537	50.40	NV		75	N	Reg IX PRG (ind)	Y	AARAR
	7439-95-4	Magnesium	809 NJ	3280 NJ	mg/kg	P-36_08/17/1999_0_0.17	3/3	NA	3280	1100	NV		NV			N	NUT
	7439-96-5	Manganese	26.1	530	mg/kg	P-36_08/17/1999_0_0.17	3/3	NA	530	110	2044	N	1945.81	N	Reg IX PRG (ind)	N	BSL
	7439-97-6	Mercury	0.023 B	0.091 B	mg/kg	P-36_08/17/1999_0_0.17	2/3	0.005-0.005	0.091	0.087	1.022	N	0.62	N	Reg IX PRG (ind)	N	BSL
	7440-02-0	Nickel	3.9 B	14.7	mg/kg	P-36_08/17/1999_0_0.17	3/3	NA	14.7	14.20	2044	N	2043.92	N	Reg IX PRG (ind)	N	BSL
	7440-09-7	Potassium	701 J	4790 J	mg/kg	P-36_08/17/1999_0.17_1	3/3	NA	4790	2400	NV		NV			N	NUT
	7782-49-2	Selenium	1.3 N	1.3 N	mg/kg	P-36_08/17/1999_0.17_1	1/3	0.47-0.51	1.3	1.80	511	N	510.99	N	Reg IX PRG (ind)	N	BSL
	7440-23-5	Sodium	63.1 B	182	mg/kg	P-36_08/17/1999_0_0.17	3/3	NA	182	166	NV		NV			N	NUT
	7440-28-0	Thallium	1.3 B	1.4 B	mg/kg	P-36_08/17/1999_0.17_1	2/3	0.78-0.78	1.4	1.5	7.154	N	6.75	N	Reg IX PRG (ind)	N	BSL
	7440-62-2	Vanadium	21.3	109	mg/kg	P-36_08/17/1999_4_5	3/3	NA	109	61.20	715.4	N	715.39	N	Reg IX PRG (ind)	N	BSL
	7440-66-6	Zinc	39.8	68.4	mg/kg	P-36_08/17/1999_0.17_1	3/3	NA	68.4	67.70	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	SVOCs																
	105-67-9	2,4-Dimethylphenol	2.8 J	2.8 J	mg/kg	P-36_08/17/1999_4_5	1/3	0.076-0.083	2.8	ND	2044	N	1231.21	N	Reg IX PRG (ind)	N	BSL
	91-57-6	2-Methylnapthalene	27	27	mg/kg	P-37_08/17/1999_13_14	1/3	0.038-0.042	27	ND	2044	N	NV			N	BSL
	95-48-7	2-Methylphenol	0.78 J	0.78 J	mg/kg	P-36_08/17/1999_4_5	1/3	0.038-0.042	0.78	ND	5110	N	3078.03	N	Reg IX PRG (ind)	N	BSL
	106-44-5	4-Methylphenol	2.2 J	2.2 J	mg/kg	P-36_08/17/1999_4_5	1/3	0.076-0.083	2.2	ND	511	N	307.80	N	Reg IX PRG (ind)	N	BSL
	83-32-9	Acenaphthene	1.2 J	1.2 J	mg/kg	P-36_08/17/1999_4_5	1/3	0.038-0.042	1.2	ND	6132	N	2921.93	N	Reg IX PRG (ind)	N	BSL
	208-96-8	Acenaphthylene	0.4 J	0.4 J	mg/kg	P-36_08/17/1999_4_5	1/3	0.038-0.042	0.4	ND	NV		NV			Y	NV
	120-12-7	Anthracene	0.81 J	0.81 J	mg/kg	P-36_08/17/1999_4_5	1/3	0.038-0.042	0.81	ND	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	56-55-3	Benzo(a)anthracene	0.089 J	0.47 J	mg/kg	P-36_08/17/1999_4_5	2/3	0.038-0.038	0.47	0.07	3.92	C	2.11	C	Reg IX PRG (res)	N	BSL
	50-32-8	Benzo(a)pyrene	0.077 J	0.077 J	mg/kg	P-36_08/17/1999_0_0.17	1/3	0.038-0.38	0.077	0.05	0.392	C	0.21	C	Reg IX PRG (ind)	N	BSL
	205-99-2	Benzo(b)fluoranthene	0.11 J	0.11 J	mg/kg	P-36_08/17/1999_0_0.17	1/3	0.038-0.38	0.11	0.11	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL

800178

Table 2-5
Selection of Chemicals of Potential Concern
AOC 1: Soil-subsurface 0-6ft (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-subsurface 0-6ft (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	191-24-2	*Benzo(g,h,i)perylene*	0.046 J	0.046 J	mg/kg	P-36_08/17/1999_0_0.17	1/3	0.038-0.38	0.046	0.046	NV		NV			Y	NV
	207-08-9	Benzo(k)fluoranthene	0.049 J	0.049 J	mg/kg	P-36_08/17/1999_0_0.17	1/3	0.038-0.38	0.049	0.038	39.2	C	21.10	C	Reg IX PRG (ind)	N	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	0.13 J	4.1	mg/kg	P-36_08/17/1999_4_5	2/3	0.076-0.076	4.1	1.3	204.4	C	123.12	C	Reg IX PRG (ind)	N	BSL
	85-68-7	*Butyl benzyl phthalate*	0.8 J	0.8 J	mg/kg	P-36_08/17/1999_4_5	1/3	0.076-0.083	0.8	0.47	20440	N	10000	max	Reg IX PRG (ind)	N	BSL
	218-01-9	Chrysene	0.079 J	0.62 J	mg/kg	P-36_08/17/1999_4_5	2/3	0.038-0.038	0.62	0.082	392	C	210.96	C	Reg IX PRG (ind)	N	BSL
	132-64-9	Dibenzofuran	0.87 J	0.87 J	mg/kg	P-36_08/17/1999_4_5	1/3	0.038-0.042	0.87	ND	204.4	N	312.67	N	Reg IX PRG (ind)	N	BSL
	206-44-0	Fluoranthene	0.11 J	0.93 J	mg/kg	P-36_08/17/1999_4_5	2/3	0.038-0.038	0.93	0.11	4088	N	2200.04	N	Reg IX PRG (ind)	N	BSL
	86-73-7	Fluorene	2.1 J	2.1 J	mg/kg	P-36_08/17/1999_4_5	1/3	0.038-0.042	2.1	0.16	4088	N	2628.14	N	Reg IX PRG (ind)	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.05 J	0.05 J	mg/kg	P-36_08/17/1999_0_0.17	1/3	0.038-0.38	0.05	0.05	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	78-59-1	Isophorone	24	24	mg/kg	P-36_08/17/1999_4_5	1/3	0.038-0.042	24	ND	3012.21	C	1814.42	C	Reg IX PRG (ind)	N	BSL
	91-20-3	Naphthalene	19	19	mg/kg	P-36_08/17/1999_4_5	1/3	0.038-0.042	19	ND	2044	N	18.77	N	Reg IX PRG (ind)	Y	AARAR
	86-30-6	n-Nitrosodiphenylamine	3.1 J	3.1 J	mg/kg	P-36_08/17/1999_4_5	1/3	0.038-0.042	3.1	ND	584	C	351.78	C	Reg IX PRG (ind)	N	BSL
	85-01-8	Phenanthrene	0.051 J	7.2	mg/kg	P-36_08/17/1999_4_5	2/3	0.038-0.038	7.2	0.089	NV		NV			Y	NV
	108-95-2	PHENOL	2.2 J	2.2 J	mg/kg	P-36_08/17/1999_4_5	1/3	0.076-0.083	2.2	ND	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	129-00-0	Pyrene	0.088 J	3.1 J	mg/kg	P-36_08/17/1999_4_5	2/3	0.038-0.038	3.1	0.11	3066.00	N	2912.62	N	Reg IX PRG (ind)	N	BSL
		VOCs															
	120-82-1	1,2,4-Trichlorobenzene	1.9 J	1.9 J	mg/kg	P-36_08/17/1999_4_5	1/3	0.038-0.042	1.9	ND	1022	N	300	sat	Reg IX PRG (ind)	N	BSL
	95-50-1	1,2-Dichlorobenzene	7.3	7.3	mg/kg	P-36_08/17/1999_4_5	1/3	0.038-0.042	7.3	ND	9198	N	37	sat	Reg IX PRG (ind)	N	BSL
	106-46-7	1,4-Dichlorobenzene	0.42 J	0.42 J	mg/kg	P-36_08/17/1999_4_5	1/3	0.038-0.042	0.42	ND	119.23	C	7.87	C	Reg IX PRG (ind)	N	BSL
		PCBs															
	1336-36-3	Total PCBs	0.005	11.06	mg/kg	P-36_08/17/1999_4_5	3/3	NA	11.06	0.068	1.43	C	0.74	C	Reg IX PRG (ind)	Y	ASL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Industrial Region III Soil RBCs . HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800179

Table 2-6
Selection of Chemicals of Potential Concern
AOC 2: Soil-surface 0-6in (residential)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	*Soil*
Exposure Medium:	Soil-surface 0-6in (residential)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC 2	**Metals**																
	7429-90-5	Aluminum	5850 *	5850 *	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	5850	5610	7821.43	N	7614.20	N	Reg IX PRG (res)	N	BSL
	7440-38-2	Arsenic	5.7 *	5.7 *	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	5.7	13.80	0.43	C	0.39	C	Reg IX PRG (res)	Y	ASL
	7440-39-3	Barium	40.9	40.9	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	40.9	36.60	547.50	N	537.49	N	Reg IX PRG (res)	N	BSL
	7440-41-7	Beryllium	0.36 B	0.36 B	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.36	0.83	15.64	N	15.44	N	Reg IX PRG (res)	N	BSL
	7440-43-9	Cadmium	0.48 JBN	0.48 JBN	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.48	0.71	3.91	N	3.70	N	Reg IX PRG (res)	N	BSL
	7440-70-2	Calcium	2690	2690	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	2690	216	NV		NV			N	NUT
	7440-47-3	Chromium	21.4 JN	21.4 JN	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	21.4	50.80	2.35	N	210.68	C	Reg IX PRG (res)	Y	ASL
	7440-48-4	Cobalt	4.4 B	4.4 B	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	4.4	4.10	156.43	N	902.89	C	Reg IX PRG (res)	N	BSL
	7440-50-8	Copper	10.4 *	10.4 *	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	10.4	10	312.86	N	312.86	N	Reg IX PRG (res)	N	BSL
	7439-89-6	Iron	13400	13400	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	13400	30200	2346.43	N	2346.32	N	Reg IX PRG (res)	Y	ASL
	7439-92-1	Lead	45.7	45.7	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	45.7	50.40	NV		40	N	Reg IX PRG (res)	Y	AARAR
	7439-95-4	Magnesium	2840 JN*	2840 JN*	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	2840	868	NV		NV			N	NUT
	7439-96-5	Manganese	344	344	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	344	76.90	156.43	N	176.24	N	Reg IX PRG (res)	Y	ASL
	7439-97-6	Mercury	0.079 BN	0.079 BN	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.079	0.09	0.08	N	0.06	N	Reg IX PRG (res)	Y	ASL
	7440-02-0	Nickel	9.5	9.5	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	9.5	11.30	156.43	N	156.43	N	Reg IX PRG (res)	N	BSL
	7440-09-7	Potassium	956 JN*	956 JN*	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	956	2400	NV		NV			N	NUT
	7440-23-5	Sodium	103 JN	103 JN	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	103	118	NV		NV			N	NUT
	7440-62-2	Vanadium	20.2 JN*	20.2 JN*	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	20.2	61.20	54.75	N	54.75	N	Reg IX PRG (res)	N	BSL
	7440-66-6	Zinc	48.5 JN*	48.5 JN*	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	48.5	31.30	2346.43	N	2346.32	N	Reg IX PRG (res)	N	BSL

800180

Table 2-6
Selection of Chemicals of Potential Concern
AOC 2: Soil-surface 0-6in (residential)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-surface 0-6in (residential)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	SVOCs																
	120-12-7	Anthracene	0.12 J	0.12 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.12	ND	2346.43	N	2189.61	N	Reg IX PRG (res)	N	BSL
	56-55-3	Benzo(a)anthracene	0.43	0.43	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.43	0.07	0.87	C	0.62	C	Reg IX PRG (res)	N	BSL
	50-32-8	Benzo(a)pyrene	0.34 J	0.34 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.34	0.05	0.09	C	0.06	C	Reg IX PRG (res)	Y	ASL
	205-99-2	Benzo(b)fluoranthene	0.41	0.41	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.41	0.11	0.87	C	0.62	C	Reg IX PRG (res)	N	BSL
	191-24-2	Benzo(g,h,i)perylene	0.18 J	0.18 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.18	0.05	NV		NV			Y	NV
	207-08-9	Benzo(k)fluoranthene	0.18 J	0.18 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.18	0.04	8.75	C	6.21	C	Reg IX PRG (res)	N	BSL
	218-01-9	Chrysene	0.4	0.4	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.4	0.08	87.50	C	62.15	C	Reg IX PRG (res)	N	BSL
	53-70-3	Dibenzo(a,h)anthracene	0.074 J	0.074 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.074	NA	0.09	C	0.06	C	Reg IX PRG (res)	Y	AARAR
	206-44-0	Fluoranthene	0.8	0.8	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.8	0.11	312.86	N	229.36	N	Reg IX PRG (res)	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.22 J	0.22 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.22	0.05	0.87	C	0.62	C	Reg IX PRG (res)	N	BSL
	85-01-8	Phenanthrene	0.33 J	0.33 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.33	0.09	NV		NV			Y	NV
	129-00-0	Pyrene	0.57	0.57	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.57	0.11	234.64	N	231.60	N	Reg IX PRG (res)	N	BSL
	PCBs																
	1336-36-3	Total PCBs	0.45	0.45	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.45	0.008	0.32	C	0.22	C	Reg IX PRG (res)	Y	ASL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Residential Region III Soil RBCs . HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800181

Table 2-7
Selection of Chemicals of Potential Concern
AOC 2: Soil-surface 0-6in (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-surface 0-6in (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC 2	Metals																
	7429-90-5	Aluminum	5850 *	5850 *	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	5850	5610	102200	N	10000	max	Reg IX PRG (ind)	N	BSL
	7440-38-2	Arsenic	5.7 *	5.7 *	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	5.7	13.80	1.91	C	1.59	C	Reg IX PRG (ind)	Y	ASL
	7440-39-3	Barium	40.9	40.9	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	40.9	36.60	7154.00	N	6657.73	N	Reg IX PRG (ind)	N	BSL
	7440-41-7	Beryllium	0.36 B	0.36 B	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.36	0.83	204.40	N	1940.69	C	Reg IX PRG (ind)	N	BSL
	7440-43-9	Cadmium	0.48 JBN	0.48 JBN	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.48	0.71	51.10	N	45.14	N	Reg IX PRG (ind)	N	BSL
	7440-70-2	Calcium	2690	2690	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	2690	216	NV		NV			N	NUT
	7440-47-3	Chromium	21.4 JN	21.4 JN	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	21.4	50.80	30.66	N	448.32	C	Reg IX PRG (ind)	N	BSL
	7440-48-4	Cobalt	4.4 B	4.4 B	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	4.4	4.10	2044	N	1921.35	C	Reg IX PRG (ind)	N	BSL
	7440-50-8	Copper	10.4 *	10.4 *	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	10.4	10	4088	N	4087.67	N	Reg IX PRG (ind)	N	BSL
	7439-89-6	Iron	13400	13400	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	13400	30200	30660	N	10000	max	Reg IX PRG (ind)	Y	AARAR
	7439-92-1	Lead	45.7	45.7	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	45.7	50.40	NV		75.00	N	Reg IX PRG (ind)	N	BSL
	7439-95-4	Magnesium	2840 JN*	2840 JN*	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	2840	868	NV		NV			N	NUT
	7439-96-5	Manganese	344	344	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	344	76.90	2044	N	1945.81	N	Reg IX PRG (ind)	N	BSL
	7439-97-6	Mercury	0.079 BN	0.079 BN	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.079	0.09	1.02	N	0.62	N	Reg IX PRG (ind)	N	BSL
	7440-02-0	Nickel	9.5	9.5	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	9.5	11.30	2044	N	2043.92	N	Reg IX PRG (ind)	N	BSL
	7440-09-7	Potassium	956 JN*	956 JN*	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	956	2400	NV		NV			N	NUT
	7440-23-5	Sodium	103 JN	103 JN	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	103	118	NV		NV			N	NUT
	7440-62-2	Vanadium	20.2 JN*	20.2 JN*	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	20.2	61.20	715.40	N	715.39	N	Reg IX PRG (ind)	N	BSL
	7440-66-6	Zinc	48.5 JN*	48.5 JN*	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	48.5	31.30	30660	N	10000	max	Reg IX PRG (ind)	N	BSL

Table 2-7
Selection of Chemicals of Potential Concern
AOC 2: Soil-surface 0-6in (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-surface 0-6in (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	SVOCs																
	120-12-7	Anthracene	0.12 J	0.12 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.12	ND	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	56-55-3	Benzo(a)anthracene	0.43	0.43	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.43	0.07	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	50-32-8	Benzo(a)pyrene	0.34 J	0.34 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.34	0.05	0.39	C	0.21	C	Reg IX PRG (ind)	Y	AARAR
	205-99-2	Benzo(b)fluoranthene	0.41	0.41	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.41	0.11	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	191-24-2	Benzo(g,h,i)perylene	0.18 J	0.18 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.18	0.05	NV		NV			Y	NV
	207-08-9	Benzo(k)fluoranthene	0.18 J	0.18 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.18	0.04	39.20	C	21.10	C	Reg IX PRG (ind)	N	BSL
	218-01-9	Chrysene	0.4	0.4	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.4	0.08	392	C	210.96	C	Reg IX PRG (ind)	N	BSL
	53-70-3	Dibenzo(a,h)anthracene	0.074 J	0.074 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.074	NA	0.39	C	0.21	C	Reg IX PRG (ind)	N	BSL
	206-44-0	Fluoranthene	0.8	0.8	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.8	0.11	4088	N	2200.04	N	Reg IX PRG (ind)	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.22 J	0.22 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.22	0.05	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	85-01-8	Phenanthrene	0.33 J	0.33 J	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.33	0.09	NV		NV			Y	NV
	129-00-0	Pyrene	0.57	0.57	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.57	0.11	3066	N	2912.62	N	Reg IX PRG (ind)	N	BSL
	PCBs																
	1336-36-3	Total PCBs	0.45	0.45	mg/kg	P-31_08/20/1999_0_0.17	1/1	NA	0.45	0.008	1.43	C	0.74	C	Reg IX PRG (ind)	N	BSL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Industrial Region III Soil RBCs . HQ for NC compounds conservatively adjusted to 0.1.

Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.

Methyl mercury is used by both Region IX and Region III for this table.

The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) *Rationale Codes:*

BSL = Below Screening Level

NV = No toxicity value available: COPC

ASL = Above Screening Level

AARAR =Above Applicable or Relevant and Appropriate Requirements

NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits

* = Duplicate analysis not within control limits.

P = Concentration difference between primary and confirmation columns >25%.

J = Estimated Value.

B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic

max = Ceiling limit

sat = Soil saturation

800183

Table 2-8
Selection of Chemicals of Potential Concern
AOC 2: Soil-subsurface 0-6ft (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-subsurface 0-6ft (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC 2	**Metals**																
	7429-90-5	Aluminum	1530 *	5850 *	mg/kg	P-31/SO/0-2	4/4	NA	5850	8450	102200	N	10000	max	Reg IX PRG (ind)	N	BSL
	7440-38-2	Arsenic	0.95 B	5.7 *	mg/kg	P-31/SO/0-2	4/4	NA	5.7	13.80	1.91	C	1.59	C	Reg IX PRG (ind)	Y	ASL
	7440-39-3	Barium	22.5 *	67.9	mg/kg	P-31/SO/2-12	4/4	NA	67.9	138.00	7154	N	6657.73	N	Reg IX PRG (ind)	N	BSL
	7440-41-7	Beryllium	0.21 B	0.36 B	mg/kg	P-31/SO/0-2	3/4	0.16-0.16	0.36	1.40	204.40	N	1940.69	C	Reg IX PRG (ind)	N	BSL
	7440-43-9	Cadmium	0.21 JBN	0.48 JBN	mg/kg	P-31/SO/0-2	2/4	0.17-0.19	0.48	0.71	51.10	N	45.14	N	Reg IX PRG (ind)	N	BSL
	7440-70-2	Calcium	128 NJ*	2690	mg/kg	P-31/SO/0-2	4/4	NA	2690	3090	NV		NV			N	NUT
	7440-47-3	Chromium	5.6 NJ*	27.6 *	mg/kg	P-31/SO/0-1	5/5	NA	27.6	50.80	30.66	N	448.32	C	Reg IX PRG (ind)	N	BSL
	18540-29-9	Chromium (hexavalent)	0.3 J	0.3 J	mg/kg	P-31/SO/0-1	1/1	NA	0.3	NA	306.60	N	64.05	C	Reg IX PRG (ind)	N	BSL
	7440-48-4	Cobalt	1.1 B	4.4 B	mg/kg	P-31/SO/0-2	2/4	1-1.2	4.4	5.90	2044	N	1921.35	C	Reg IX PRG (ind)	N	BSL
	7440-50-8	Copper	1.8 B	10.4 *	mg/kg	P-31/SO/0-2	4/4	NA	10.4	10.10	4088	N	4087.67	N	Reg IX PRG (ind)	N	BSL
	7439-89-6	Iron	3110 *	13400	mg/kg	P-31/SO/0-2	4/4	NA	13400	30200	30660	N	10000	max	Reg IX PRG (ind)	Y	AARAR
	7439-92-1	Lead	5.4 *	244	mg/kg	P-31/SO/2-12	4/4	NA	244	50.40	NV		75.00	N	Reg IX PRG (ind)	Y	AARAR
	7439-95-4	Magnesium	174 JN*	2840 JN*	mg/kg	P-31/SO/0-2	4/4	NA	2840	1100	NV		NV			N	NUT
	7439-96-5	Manganese	11.3	344	mg/kg	P-31/SO/0-2	4/4	NA	344	110	2044	N	1945.81	N	Reg IX PRG (ind)	N	BSL
	7439-97-6	Mercury	0.007 B	0.079 BN	mg/kg	P-31/SO/0-2	4/4	NA	0.079	0.09	1.02	N	0.62	N	Reg IX PRG (ind)	N	BSL
	7440-02-0	Nickel	2.7 B	9.5	mg/kg	P-31/SO/0-2	4/4	NA	9.5	14.20	2044	N	2043.92	N	Reg IX PRG (ind)	N	BSL
	7440-09-7	Potassium	164 JN*	956 JN*	mg/kg	P-31/SO/0-2	4/4	NA	956	2400	NV		NV			N	NUT
	7440-23-5	Sodium	65.7 B	103 JN	mg/kg	P-31/SO/0-2	4/4	NA	103	166	NV		NV			N	NUT
	7440-62-2	Vanadium	7 J*	20.2 JN*	mg/kg	P-31/SO/0-2	4/4	NA	20.2	61.20	715.40	N	715.39	N	Reg IX PRG (ind)	N	BSL
	7440-66-6	Zinc	10.3 B*	60.3 JN*	mg/kg	P-31/SO/2-12	4/4	NA	60.3	67.70	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	SVOCs																
	91-57-6	2-Methylnapthalene	4.9	5.9	mg/kg	P-31_08/20/1999_0.17_1	2/4	0.034-0.039	5.9	ND	2044	N	NV			N	BSL
	83-32-9	Acenaphthene	0.072 J	0.18 J	mg/kg	P-30_08/19/1999_5_6	2/4	0.034-0.83	0.18	ND	6132	N	2921.93	N	Reg IX PRG (ind)	N	BSL
	208-96-8	Acenaphthylene	0.042 J	0.23 J	mg/kg	P-31_08/20/1999_0.17_1	3/4	0.034-0.034	0.23	ND	NV		NV			Y	NV
	120-12-7	Anthracene	0.053 J	0.12 J	mg/kg	P-31_08/20/1999_0_0.17	3/4	0.069-0.069	0.12	ND	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	56-55-3	Benzo(a)anthracene	0.052 J	0.43	mg/kg	P-31_08/20/1999_0_0.17	3/4	0.069-0.069	0.43	0.07	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	50-32-8	Benzo(a)pyrene	0.34 J	0.34 J	mg/kg	P-31_08/20/1999_0_0.17	1/4	0.036-0.069	0.34	0.05	0.39	C	0.21	C	Reg IX PRG (ind)	Y	AARAR
	205-99-2	Benzo(b)fluoranthene	0.046 J	0.41	mg/kg	P-31_08/20/1999_0_0.17	3/4	0.069-0.069	0.41	0.11	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	191-24-2	Benzo(g,h,i)perylene	0.039 J	0.18 J	mg/kg	P-31_08/20/1999_0_0.17	2/4	0.039-0.069	0.18	0.05	NV		NV			Y	NV
	207-08-9	Benzo(k)fluoranthene	0.18 J	0.18 J	mg/kg	P-31_08/20/1999_0_0.17	1/4	0.036-0.069	0.18	0.04	39.20	C	21.10	C	Reg IX PRG (ind)	N	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	0.35 J	0.86	mg/kg	P-30_08/19/1999_5_6	2/4	0.069-0.14	0.86	1.30	204.40	C	123.12	C	Reg IX PRG (ind)	N	BSL

800184

Table 2-8
Selection of Chemicals of Potential Concern
AOC 2: Soil-subsurface 0-6ft (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-subsurface 0-6ft (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	85-68-7	Butyl benzyl phthalate	15	15	mg/kg	P-30_08/19/1999_5_6	1/4	0.069-0.14	15	0.47	20440	N	10000	max	Reg IX PRG (ind)	N	BSL
	218-01-9	Chrysene	0.075 J	0.4	mg/kg	P-31_08/20/1999_0_0.17	3/4	0.069-0.069	0.4	0.08	392.00	C	210.96	C	Reg IX PRG (ind)	N	BSL
	53-70-3	Dibenzo(a,h)anthracene	0.074 J	0.074 J	mg/kg	P-31_08/20/1999_0_0.17	1/4	0.036-0.069	0.074	ND	0.39	C	0.21	C	Reg IX PRG (ind)	N	BSL
	132-64-9	Dibenzofuran	0.07 J	0.19 J	mg/kg	P-30_08/19/1999_5_6	2/4	0.034-0.069	0.19	ND	204.40	N	312.67	N	Reg IX PRG (ind)	N	BSL
	84-66-2	Diethyl phthalate	0.12 J	0.54 J	mg/kg	P-31_08/20/1999_0.17_1	2/4	0.069-0.078	0.54	ND	81760	N	10000	max	Reg IX PRG (ind)	N	BSL
	84-74-2	Di-n-butyl phthalate	0.47 J	1.8	mg/kg	P-30_08/19/1999_5_6	2/4	0.069-0.078	1.8	ND	10220	N	6156.06	N	Reg IX PRG (ind)	N	BSL
	206-44-0	Fluoranthene	0.074 J	0.8	mg/kg	P-31_08/20/1999_0_0.17	4/4	NA	0.8	0.11	4088	N	2200.04	N	Reg IX PRG (ind)	N	BSL
	86-73-7	Fluorene	0.19 J	1.5	mg/kg	P-31_08/20/1999_0.17_1	3/4	0.034-0.034	1.5	0.16	4088	N	2628.14	N	Reg IX PRG (ind)	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.22 J	0.22 J	mg/kg	P-31_08/20/1999_0_0.17	1/4	0.036-0.069	0.22	0.05	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	91-20-3	Naphthalene	1.3	2.8	mg/kg	P-30_08/19/1999_5_6	2/4	0.034-0.039	2.8	ND	2044	N	18.77	N	Reg IX PRG (ind)	N	BSL
	86-30-6	n-Nitrosodiphenylamine	0.39	0.87	mg/kg	P-30_08/19/1999_5_6	2/4	0.034-0.069	0.87	ND	584	C	351.78	C	Reg IX PRG (ind)	N	BSL
	85-01-8	Phenanthrene	0.33 J	4.1	mg/kg	P-31_08/20/1999_0.17_1	4/4	NA	4.1	0.09	NV		NV			Y	NV
	108-95-2	PHENOL	0.12 J	0.12 J	mg/kg	P-30_08/19/1999_5_6	1/4	0.069-0.14	0.12	ND	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	129-00-0	Pyrene	0.37	1.5	mg/kg	P-31_08/20/1999_0.17_1	4/4	NA	1.5	0.11	3066	N	2912.62	N	Reg IX PRG (ind)	N	BSL
	VOCs																
	120-82-1	1,2,4-Trichlorobenzene	0.13 J	0.19 J	mg/kg	P-31_08/20/1999_0.17_1	2/4	0.034-0.039	0.19	ND	1022	N	300	sat	Reg IX PRG (ind)	N	BSL
	95-50-1	1,2-Dichlorobenzene	0.27 J	2.1	mg/kg	P-31_08/20/1999_0.17_1	3/4	0.034-0.034	2.1	ND	9198	N	37	sat	Reg IX PRG (ind)	N	BSL
	106-46-7	1,4-Dichlorobenzene	0.067 J	0.13 J	mg/kg	P-31_08/20/1999_0.17_1	2/4	0.034-0.039	0.13	ND	119.23	C	7.87	C	Reg IX PRG (ind)	N	BSL
	PCBs																
	1336-36-3	Total PCBs	0.31	3.01	mg/kg	P-30_08/19/1999_5_6	4/4	NA	3.01	0.07	1.43	C	0.74	C	Reg IX PRG (ind)	Y	ASL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Industrial Region III Soil RBCs . HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available; COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.
D= Compound quantitated on a diluted sample.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800185

Table 2-9
Selection of Chemicals of Potential Concern
AOC 3: Soil-subsurface (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	*Current/Future*
Medium:	Soil
Exposure Medium:	Soil-subsurface (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC 3	**Metals**																
	7429-90-5	Aluminum	4180	4180	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	4180	8450	102200	N	10000	max	Reg IX PRG (ind)	N	BSL
	7440-38-2	Arsenic	3	3	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	3	13.80	1.91	C	1.59	C	Reg IX PRG (ind)	Y	ASL
	7440-39-3	Barium	12.7	12.7	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	12.7	138	7154	N	6657.73	N	Reg IX PRG (ind)	N	BSL
	7440-41-7	Beryllium	0.23 B	0.23 B	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.23	1.40	204.4	N	1940.69	C	Reg IX PRG (ind)	N	BSL
	7440-70-2	Calcium	135	135	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	135	3090	NV		NV			N	NUT
	7440-47-3	Chromium	20.5	20.5	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	20.5	50.80	30.66	N	448.32	C	Reg IX PRG (ind)	N	BSL
	7440-48-4	Cobalt	2.1 B	2.1 B	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	2.1	5.90	2044	N	1921.35	C	Reg IX PRG (ind)	N	BSL
	7440-50-8	Copper	4.1 B	4.1 B	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	4.1	10.10	4088	N	4087.67	N	Reg IX PRG (ind)	N	BSL
	7439-89-6	Iron	7880	7880	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	7880	30200	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	7439-92-1	Lead	5	5	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	5	50.40	NV		75.00	N	Reg IX PRG (ind)	N	BSL
	7439-95-4	Magnesium	744	744	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	744	1100	NV		NV			N	NUT
	7439-96-5	Manganese	81.6	81.6	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	81.6	110	2044	N	1945.81	N	Reg IX PRG (ind)	N	BSL
	7439-97-6	Mercury	0.016 B	0.016 B	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.016	0.09	1.02	N	0.62	N	Reg IX PRG (ind)	N	BSL
	7440-02-0	Nickel	4.7 B	4.7 B	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	4.7	14.20	2044	N	2043.92	N	Reg IX PRG (ind)	N	BSL
	7440-09-7	Potassium	725 J	725 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	725	2400	NV		NV			N	NUT
	7440-62-2	Vanadium	11	11	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	11	61.20	715.40	N	715.39	N	Reg IX PRG (ind)	N	BSL
	7440-66-6	Zinc	17.3	17.3	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	17.3	67.70	30660	N	10000	max	Reg IX PRG (ind)	N	BSL

800186

Table 2-9
Selection of Chemicals of Potential Concern
AOC 3: Soil-subsurface (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-subsurface (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	SVOCs																
	91-57-6	2-Methylnapthalene	0.35 J	0.35 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.35	ND	2044	N	NV			N	BSL
	83-32-9	Acenaphthene	0.11 J	0.11 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.11	ND	6132	N	2921.93	N	Reg IX PRG (ind)	N	BSL
	56-55-3	Benzo(a)anthracene	0.1 J	0.1 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.1	0.07	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	50-32-8	Benzo(a)pyrene	0.054 J	0.054 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.054	0.05	0.39	C	0.21	C	Reg IX PRG (ind)	N	BSL
	205-99-2	Benzo(b)fluoranthene	0.05 J	0.05 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.05	0.11	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	191-24-2	Benzo(g,h,i)perylene	0.058 J	0.058 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.058	0.05	NV		NV			Y	NV
	218-01-9	Chrysene	0.28 J	0.28 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.28	0.08	392	C	210.96	C	Reg IX PRG (ind)	N	BSL
	132-64-9	Dibenzofuran	0.058 J	0.058 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.058	ND	204.40	N	312.67	N	Reg IX PRG (ind)	N	BSL
	206-44-0	Fluoranthene	0.087 J	0.087 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.087	0.11	4088	N	2200.04	N	Reg IX PRG (ind)	N	BSL
	86-73-7	Fluorene	0.17 J	0.17 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.17	0.16	4088	N	2628.14	N	Reg IX PRG (ind)	N	BSL
	91-20-3	Naphthalene	0.074 J	0.074 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.074	ND	2044	N	18.77	N	Reg IX PRG (ind)	N	BSL
	85-01-8	Phenanthrene	0.43	0.43	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.43	0.09	NV		NV			Y	NV
	129-00-0	Pyrene	0.34 J	0.34 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.34	0.11	3066	N	2912.62	N	Reg IX PRG (ind)	N	BSL
	VOCs																
	1330-20-7	Xylenes (Total)	0.4 J	0.4 J	mg/kg	P-44_06/09/1999_5_5.5	1/1	NA	0.4	ND	20440	N	42	sat	Reg IX PRG (ind)	N	BSL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Industrial Region III Soil RBCs . HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800187

Table 2-10
Selection of Chemicals of Potential Concern
AOC 4: Soil-subsurface 0-6ft (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-subsurface 0-6ft (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC 4	**Metals**																
	7429-90-5	Aluminum	1430	1430	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	1430	8450	102200	N	10000	max	Reg IX PRG (ind)	N	BSL
	7440-38-2	Arsenic	1.79	1.8	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	1.8	13.80	1.91	C	1.59	C	Reg IX PRG (ind)	Y	AARAR
	7440-39-3	Barium	8.89 B	8.9 B	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	8.9	138	7154	N	6657.73	N	Reg IX PRG (ind)	N	BSL
	7440-70-2	Calcium	325	325	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	325	3090	NV		NV			N	NUT
	7440-47-3	Chromium	6	6	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	6	50.80	30.66	N	448.32	C	Reg IX PRG (ind)	N	BSL
	7440-50-8	Copper	4.69	4.7	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	4.7	10.10	4088	N	4087.67	N	Reg IX PRG (ind)	N	BSL
	7439-89-6	Iron	5380	5380	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	5380	30200	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	7439-92-1	Lead	14.1	14.1	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	14.1	50.40	NV		75.00	N	Reg IX PRG (ind)	N	BSL
	7439-95-4	Magnesium	290 NJ	290 NJ	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	290	1100	NV		NV			N	NUT
	7439-96-5	Manganese	21.89	21.9	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	21.9	110	2044	N	1945.81	N	Reg IX PRG (ind)	N	BSL
	7439-97-6	Mercury	0.04 BNJ*	0.042 BNJ*	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	0.042	0.09	1.02	N	0.62	N	Reg IX PRG (ind)	N	BSL
	7440-02-0	Nickel	1.89 B	1.9 B	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	1.9	14.20	2044	N	2043.92	N	Reg IX PRG (ind)	N	BSL
	7440-09-7	Potassium	221 NJ	221 NJ	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	221	2400	NV		NV			N	NUT
	7440-62-2	Vanadium	10	10	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	10	61.20	715.40	N	715.39	N	Reg IX PRG (ind)	N	BSL
	7440-66-6	Zinc	10.39	10.4	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	10.4	67.70	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	SVOCs																
	129-00-0	Pyrene	0.038 J	0.038 J	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	0.038	0.11	3066	N	2912.62	N	Reg IX PRG (ind)	N	BSL
	PCBs																
	1336-36-3	Total PCBs	0.014 J	0.014 J	mg/kg	L-14B_09/01/1999_1_2	1/1	NA	0.014	0.07	1.43	C	0.74	C	Reg IX PRG (ind)	N	BSL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Industrial Region III Soil RBCs . HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available; COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800188

Table 2-11
Selection of Chemicals of Potential Concern
AOC 5: Soil-subsurface 0-6ft (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-subsurface 0-6ft (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC 5	**Metals**																
	7429-90-5	Aluminum	4450	4450	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	4450	8450	102200	N	10000	max	Reg IX PRG (ind)	N	BSL
	7440-38-2	Arsenic	2.4	2.4	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	2.4	13.80	1.91	C	1.59	C	Reg IX PRG (ind)	Y	ASL
	7440-39-3	Barium	18.8	18.8	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	18.8	138.00	7154	N	6657.73	N	Reg IX PRG (ind)	N	BSL
	7440-41-7	Beryllium	0.26 B	0.26 B	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	0.26	1.40	204.40	N	1940.69	C	Reg IX PRG (ind)	N	BSL
	7440-43-9	Cadmium	0.47 B	0.47 B	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	0.47	0.71	51.10	N	45.14	N	Reg IX PRG (ind)	N	BSL
	7440-70-2	Calcium	2810	2810	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	2810	3090	NV		NV			N	NUT
	7440-47-3	Chromium	11.5	11.5	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	11.5	50.80	30.66	N	448.32	C	Reg IX PRG (ind)	N	BSL
	7440-48-4	Cobalt	3 B	3 B	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	3	5.90	2044	N	1921.35	C	Reg IX PRG (ind)	N	BSL
	7440-50-8	Copper	4.5	4.5	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	4.5	10.10	4088	N	4087.67	N	Reg IX PRG (ind)	N	BSL
	7439-89-6	Iron	8320	8320	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	8320	30200	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	7439-92-1	Lead	6.6	6.6	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	6.6	50.40	NV		75	N	Reg IX PRG (ind)	N	BSL
	7439-95-4	Magnesium	1730	1730	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	1730	1100	NV		NV			N	NUT
	7439-96-5	Manganese	50.3	50.3	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	50.3	110	2044	N	1945.81	N	Reg IX PRG (ind)	N	BSL
	7439-97-6	Mercury	0.009 B	0.009 B	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	0.009	0.09	1.02	N	0.62	N	Reg IX PRG (ind)	N	BSL
	7440-02-0	Nickel	5.6	5.6	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	5.6	14.20	2044	N	2043.92	N	Reg IX PRG (ind)	N	BSL
	7440-09-7	Potassium	737 J	737 J	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	737	2400	NV		NV			N	NUT
	7440-23-5	Sodium	102 B	102 B	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	102	166	NV		NV			N	NUT
	7440-62-2	Vanadium	15.1	15.1	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	15.1	61.20	715.40	N	715.39	N	Reg IX PRG (ind)	N	BSL
	7440-66-6	Zinc	16	16	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	16	67.70	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	SVOCs																
	117-81-7	bis(2-Ethylhexyl)phthalate	0.097 J	0.097 J	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	0.097	1.30	204.40	C	123.12	C	Reg IX PRG (ind)	N	BSL
	VOCs																
	1330-20-7	Xylenes (Total)	0.002 J	0.002 J	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	0.002	ND	20440	N	42	sat	Reg IX PRG (ind)	N	BSL
	PCBs																
	1336-36-3	Total PCBs	0.036	0.036	mg/kg	P-21_06/14/1999_5_5.5	1/1	NA	0.036	0.07	1.43	C	0.74	C	Reg IX PRG (ind)	N	BSL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Industrial Region III Soil RBCs . HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800189

Table 2-12
Selection of Chemicals of Potential Concern
AOC 6: Soil-subsurface 0-7ft (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-subsurface 0-7ft (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC 6	Metals																
	7429-90-5	Aluminum	1350	2090	mg/kg	PB-3_06/21/1999_3_4	4/4	NA	2090	8450	102200	N	10000	max	Reg IX PRG (ind)	N	BSL
	7440-38-2	Arsenic	0.89 B	1.2	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	1.2	13.80	1.91	C	1.59	C	Reg IX PRG (ind)	N	BSL
	7440-39-3	Barium	5.9 B	20	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	20	138	7154	N	6657.73	N	Reg IX PRG (ind)	N	BSL
	7440-70-2	Calcium	105 N*	980 N*	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	980	3090	NV		NV			N	NUT
	7440-47-3	Chromium	5 N	14.8 N	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	14.8	50.80	30.66	N	448.32	C	Reg IX PRG (ind)	N	BSL
	7440-48-4	Cobalt	1.2 B	1.2 B	mg/kg	PB-4_06/18/1999_5_5.5	1/4	1-1	1.2	5.90	2044	N	1921.35	C	Reg IX PRG (ind)	N	BSL
	7440-50-8	Copper	1.2 BN	2.8 BN	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	2.8	10.10	4088	N	4087.67	N	Reg IX PRG (ind)	N	BSL
	7439-89-6	Iron	2880	4470	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	4470	30200	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	7439-92-1	Lead	2.8	18.5	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	18.5	50.40	NV		75	N	Reg IX PRG (ind)	N	BSL
	7439-95-4	Magnesium	190	527	mg/kg	PB-3_06/21/1999_3_4	4/4	NA	527	1100	NV		NV			N	NUT
	7439-96-5	Manganese	13.3	197	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	197	110	2044	N	1945.81	N	Reg IX PRG (ind)	N	BSL
	7439-97-6	Mercury	0.01 B	0.01 B	mg/kg	PB-3_06/21/1999_6_7	1/4	0.005-0.005	0.01	0.09	1.02	N	0.62	N	Reg IX PRG (ind)	N	BSL
	7440-02-0	Nickel	1.7 B	2.5 B	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	2.5	14.20	2044	N	2043.92	N	Reg IX PRG (ind)	N	BSL
	7440-09-7	Potassium	214 N	368 N	mg/kg	PB-3_06/21/1999_3_4	4/4	NA	368	2400	NV		NV			N	NUT
	7440-23-5	Sodium	30.1 B	55.1 B	mg/kg	PB-3_06/21/1999_3_4	2/4	16.6-16.7	55.1	166	NV		NV			N	NUT
	7440-28-0	Thallium	0.8 B	0.8 B	mg/kg	PB-4_06/18/1999_5_5.5	1/4	0.71-0.71	0.8	1.50	7.15	N	6.75	N	Reg IX PRG (ind)	N	BSL
	7440-62-2	Vanadium	5.4	11.4	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	11.4	61.20	715.40	N	715.39	N	Reg IX PRG (ind)	N	BSL
	7440-66-6	Zinc	5.1 B	11.6	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	11.6	67.70	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	SVOCs																
	91-57-6	2-Methylnapthalene	3.3	20 D	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	20	ND	2044	N	NV			N	BSL
	83-32-9	Acenaphthene	0.36	1.5	mg/kg	PB-4_06/18/1999_6_7	3/4	0.035-0.035	1.5	ND	6132	N	2921.93	N	Reg IX PRG (ind)	N	BSL
	120-12-7	Anthracene	0.11 J	0.63 J	mg/kg	PB-4_06/18/1999_6_7	3/4	0.035-0.035	0.63	ND	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	56-55-3	Benzo(a)anthracene	0.22 J	0.85	mg/kg	PB-3_06/21/1999_6_7	4/4	NA	0.85	0.07	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	50-32-8	Benzo(a)pyrene	0.097 J	0.25 J	mg/kg	PB-3_06/21/1999_6_7	2/4	0.035-0.07	0.25	0.05	0.39	C	0.21	C	Reg IX PRG (ind)	Y	AARAR
	205-99-2	Benzo(b)fluoranthene	0.19 J	0.52	mg/kg	PB-3_06/21/1999_6_7	2/4	0.035-0.07	0.52	0.11	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	191-24-2	Benzo(g,h,i)perylene	0.082 J	0.082 J	mg/kg	PB-3_06/21/1999_3_4	1/4	0.035-0.07	0.082	0.05	NV		NV			Y	NV

800190

Table 2-12
Selection of Chemicals of Potential Concern
AOC 6: Soil-subsurface 0-7ft (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-subsurface 0-7ft (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	117-81-7	bis(2-Ethylhexyl)phthalate	0.25 J	3.6	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	3.6	1.30	204.40 C	123.12 C	Reg IX PRG (ind)	N	BSL
	85-68-7	Butyl benzyl phthalate	0.53	0.53	mg/kg	PB-3_06/21/1999_6_7	1/4	0.07-0.14	0.53	0.47	20440 N	10000 max	Reg IX PRG (ind)	N	BSL
	218-01-9	Chrysene	0.19 J	0.43 J	mg/kg	PB-4_06/18/1999_6_7	3/4	0.035-0.035	0.43	0.08	392 C	210.96 C	Reg IX PRG (ind)	N	BSL
	132-64-9	Dibenzofuran	0.94	0.94	mg/kg	PB-4_06/18/1999_6_7	1/4	0.035-0.035	0.94	ND	204.40 N	312.67 N	Reg IX PRG (ind)	N	BSL
	206-44-0	Fluoranthene	0.22 J	0.93	mg/kg	PB-3_06/21/1999_6_7	4/4	NA	0.93	0.11	4088 N	2200.04 N	Reg IX PRG (ind)	N	BSL
	86-73-7	Fluorene	0.4	2.3	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	2.3	0.16	4088 N	2628.14 N	Reg IX PRG (ind)	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.086 J	0.24 J	mg/kg	PB-3_06/21/1999_6_7	2/4	0.035-0.07	0.24	0.05	3.92 C	2.11 C	Reg IX PRG (ind)	N	BSL
	91-20-3	Naphthalene	0.94	15 D	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	15	ND	2044 N	18.77 N	Reg IX PRG (ind)	N	BSL
	85-01-8	Phenanthrene	1.5	6.5	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	6.5	0.09	NV	NV		Y	NV
	129-00-0	Pyrene	0.25 J	1.7	mg/kg	PB-3_06/21/1999_6_7	4/4	NA	1.7	0.11	3066 N	2912.62 N	Reg IX PRG (ind)	N	BSL
	VOCs														
	120-82-1	1,2,4-Trichlorobenzene	0.35	3.6	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	3.6	ND	1022 N	300 sat	Reg IX PRG (ind)	N	BSL
	95-50-1	1,2-Dichlorobenzene	0.037 J	0.44 J	mg/kg	PB-4_06/18/1999_6_7	3/4	0.035-0.035	0.44	ND	9198 N	37 sat	Reg IX PRG (ind)	N	BSL
	541-73-1	1,3-Dichlorobenzene	0.05 J	0.22 J	mg/kg	PB-4_06/18/1999_6_7	3/4	0.035-0.035	0.22	ND	3066 N	6.27 N	Reg IX PRG (ind)	N	BSL
	106-46-7	1,4-Dichlorobenzene	0.17 J	0.73	mg/kg	PB-4_06/18/1999_6_7	2/4	0.035-0.035	0.73	ND	119.23 C	7.87 C	Reg IX PRG (ind)	N	BSL
	100-41-4	Ethylbenzene	25	25	mg/kg	PB-4_06/18/1999_6_7	2/2	NA	25	ND	10220 N	19.53 C	Reg IX PRG (ind)	Y	AARAR
	127-18-4	Tetrachloroethene	0.45 J	0.45 J	mg/kg	PB-4_06/18/1999_6_7	1/2	0.13-0.13	0.45	ND	5.30 C	3.42 C	Reg IX PRG (ind)	N	BSL
	108-88-3	Toluene	2.4	4.4	mg/kg	PB-4_06/18/1999_6_7	2/2	NA	4.4	0.03	20440 N	52 sat	Reg IX PRG (ind)	N	BSL
	1330-20-7	Xylenes (Total)	69	73	mg/kg	PB-4_06/18/1999_5_5.5	2/2	NA	73	ND	20440 N	42 sat	Reg IX PRG (ind)	Y	AARAR
	PCBs														
	1336-36-3	Total PCBs	2.39 J	16 P	mg/kg	PB-4_06/18/1999_6_7	4/4	NA	16	0.07	1.43 C	0.74 C	Reg IX PRG (ind)	Y	ASL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Industrial Region III Soil RBCs . HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: *N = (Inorganic) Spike Sample not within Control Limits*
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

Table 2-13
Selection of Chemicals of Potential Concern
AOC BP: Soil-surface 0-6in (residential)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-surface 0-6in (residential)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC BP	**Metals**																
	7429-90-5	Aluminum	2580	13700	mg/kg	P-34_08/16/1999_0_0.17	5/5	NA	13700	5610	7821.43	N	7614.20	N	Reg IX PRG (res)	Y	ASL
	7440-38-2	Arsenic	0.83 B	9.1	mg/kg	P-34_08/16/1999_0_0.17	4/5	0.69-0.69	9.1	13.80	0.43	C	0.39	C	Reg IX PRG (res)	Y	ASL
	7440-39-3	Barium	18.2	329	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	329	36.60	547.50	N	537.49	N	Reg IX PRG (res)	N	BSL
	7440-41-7	Beryllium	0.21 B	0.63	mg/kg	P-34_08/16/1999_0_0.17	2/5	0.23-0.38	0.63	0.83	15.64	N	15.44	N	Reg IX PRG (res)	N	BSL
	7440-43-9	Cadmium	0.67 B	0.67 B	mg/kg	P-26_06/15/1999_0_0.17	1/4	0.28-0.46	0.67	0.71	3.91	N	3.70	N	Reg IX PRG (res)	N	BSL
	7440-70-2	Calcium	307 E	7980 *	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	7980	216	NV		NV			N	NUT
	7440-47-3	Chromium	4.9 J	42.1	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	42.1	50.80	2.35	N	210.68	C	Reg IX PRG (res)	Y	ASL
	7440-48-4	Cobalt	1 B	14.1	mg/kg	P-26_06/15/1999_0_0.17	4/5	0.74-1.2	14.1	4.10	156.43	N	902.89	C	Reg IX PRG (res)	N	BSL
	7440-50-8	Copper	4.9 B	45	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	45	10.00	312.86	N	312.86	N	Reg IX PRG (res)	N	BSL
	7439-89-6	Iron	1510 *	25600	mg/kg	P-26_06/15/1999_0_0.17	4/5	5.8-5.8	25600	30200	2346.43	N	2346.32	N	Reg IX PRG (res)	Y	ASL
	7439-92-1	Lead	2.4	55.8	mg/kg	P-34_08/16/1999_0_0.17	5/5	NA	55.8	50.40	NV		40	N	Reg IX PRG (res)	Y	AARAR
	7439-95-4	Magnesium	304	10100 N	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	10100	868	NV		NV			N	NUT
	7439-96-5	Manganese	7.4	587	mg/kg	P-34_08/16/1999_0_0.17	5/5	NA	587	76.90	156.43	N	176.24	N	Reg IX PRG (res)	Y	ASL
	7439-97-6	Mercury	0.011 B	0.14	mg/kg	P-34_08/16/1999_0_0.17	4/5	0.005-0.005	0.14	0.09	0.08	N	0.06	N	Reg IX PRG (res)	Y	ASL
	7440-02-0	Nickel	1.8 B	29.3	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	29.3	11.30	156.43	N	156.43	N	Reg IX PRG (res)	N	BSL
	7440-09-7	Potassium	289 N	2680 *	mg/kg	P-34_08/16/1999_0_0.17	4/5	31.9-31.9	2680	2400	NV		NV			N	NUT
	7782-49-2	Selenium	0.7 B	1.4	mg/kg	P-26_06/15/1999_0_0.17	2/5	0.53-0.86	1.4	1.10	39.11	N	39.11	N	Reg IX PRG (res)	N	BSL
	7440-23-5	Sodium	937	937	mg/kg	P-26_06/15/1999_0_0.17	1/5	19.4-58.7	937	118	NV		NV			N	NUT
	7440-28-0	Thallium	3.9	3.9	mg/kg	P-26_06/15/1999_0_0.17	1/5	0.82-1.7	3.9	1.50	0.55	N	0.52	N	Reg IX PRG (res)	Y	ASL
	7440-62-2	Vanadium	7.4	62.8	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	62.8	61.20	54.75	N	54.75	N	Reg IX PRG (res)	Y	ASL
	7440-66-6	Zinc	7.3 B	83.9	mg/kg	P-34_08/16/1999_0_0.17	5/5	NA	83.9	31.30	2346.43	N	2346.32	N	Reg IX PRG (res)	N	BSL

Table 2-13
Selection of Chemicals of Potential Concern
AOC BP: Soil-surface 0-6in (residential)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-surface 0-6in (residential)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	SVOCs																
	56-55-3	Benzo(a)anthracene	0.08 J	0.08 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.08	0.07	0.87	C	0.62	C	Reg IX PRG (res)	N	BSL
	50-32-8	Benzo(a)pyrene	0.073 J	0.073 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.073	0.05	0.09	C	0.06	C	Reg IX PRG (res)	Y	AARAR
	205-99-2	Benzo(b)fluoranthene	0.1 J	0.1 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.1	0.11	0.87	C	0.62	C	Reg IX PRG (res)	N	BSL
	191-24-2	Benzo(g,h,i)perylene	0.041 J	0.041 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.041	0.05	NV		NV			Y	NV
	207-08-9	Benzo(k)fluoranthene	0.041 J	0.041 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.041	0.04	8.75	C	6.21	C	Reg IX PRG (res)	N	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	0.14 J	0.14 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.035-0.14	0.14	0.18	45.62	C	34.74	C	Reg IX PRG (res)	N	BSL
	218-01-9	Chrysene	0.079 J	0.079 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.079	0.08	87.50	C	62.15	C	Reg IX PRG (res)	N	BSL
	206-44-0	Fluoranthene	0.15 J	0.15 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.15	0.11	312.86	N	229.36	N	Reg IX PRG (res)	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.044 J	0.044 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.044	0.05	0.87	C	0.62	C	Reg IX PRG (res)	N	BSL
	85-01-8	Phenanthrene	0.083 J	0.083 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.083	0.09	NV		NV			Y	NV
	129-00-0	Pyrene	0.096 J	0.096 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.096	0.11	234.64	N	231.60	N	Reg IX PRG (res)	N	BSL
	PCBs																
	1336-36-3	Total PCBs	0.055	0.71	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	0.71	0.01	0.32	C	0.22	C	Reg IX PRG (res)	Y	ASL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Residential Region III Soil RBCs . HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800193

Table 2-14
Selection of Chemicals of Potential Concern
AOC BP: Soil-surface 0-6in (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-surface 0-6in (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC BP	**Metals**																
	7429-90-5	Aluminum	2580	13700	mg/kg	P-34_08/16/1999_0_0.17	5/5	NA	13700	5610	102200	N	10000	max	Reg IX PRG (ind)	Y	AARAR
	7440-38-2	Arsenic	0.83 B	9.1	mg/kg	P-34_08/16/1999_0_0.17	4/5	0.69-0.69	9.1	13.80	1.91	C	1.59	C	Reg IX PRG (ind)	Y	ASL
	7440-39-3	Barium	18.2	329	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	329	36.60	7154	N	6657.73	N	Reg IX PRG (ind)	N	BSL
	7440-41-7	Beryllium	0.21 B	0.63	mg/kg	P-34_08/16/1999_0_0.17	2/5	0.23-0.38	0.63	0.83	204.40	N	1940.69	C	Reg IX PRG (ind)	N	BSL
	7440-43-9	Cadmium	0.67 B	0.67 B	mg/kg	P-26_06/15/1999_0_0.17	1/4	0.28-0.46	0.67	0.71	51.10	N	45.14	N	Reg IX PRG (ind)	N	BSL
	7440-70-2	Calcium	307 E	7980 *	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	7980	216	NV		NV			N	NUT
	7440-47-3	Chromium	4.9 J	42.1	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	42.1	50.80	30.66	N	448.32	C	Reg IX PRG (ind)	Y	ASL
	7440-48-4	Cobalt	1 B	14.1	mg/kg	P-26_06/15/1999_0_0.17	4/5	0.74-1.2	14.1	4.10	2044	N	1921.35	C	Reg IX PRG (ind)	N	BSL
	7440-50-8	Copper	4.9 B	45	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	45	10.00	4088	N	4087.67	N	Reg IX PRG (ind)	N	BSL
	7439-89-6	Iron	1510 *	25600	mg/kg	P-26_06/15/1999_0_0.17	4/5	5.8-5.8	25600	30200	30660	N	10000	max	Reg IX PRG (ind)	Y	AARAR
	7439-92-1	Lead	2.4	55.8	mg/kg	P-34_08/16/1999_0_0.17	5/5	NA	55.8	50.40	NV		75	N	Reg IX PRG (ind)	N	BSL
	7439-95-4	Magnesium	304	10100 N	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	10100	868	NV		NV			N	NUT
	7439-96-5	Manganese	7.4	587	mg/kg	P-34_08/16/1999_0_0.17	5/5	NA	587	76.90	2044	N	1945.81	N	Reg IX PRG (ind)	N	BSL
	7439-97-6	Mercury	0.011 B	0.14	mg/kg	P-34_08/16/1999_0_0.17	4/5	0.005-0.005	0.14	0.09	1.02	N	0.62	N	Reg IX PRG (ind)	N	BSL
	7440-02-0	Nickel	1.8 B	29.3	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	29.3	11.30	2044	N	2043.92	N	Reg IX PRG (ind)	N	BSL
	7440-09-7	Potassium	289 N	2680 *	mg/kg	P-34_08/16/1999_0_0.17	4/5	31.9-31.9	2680	2400	NV		NV			N	NUT
	7782-49-2	Selenium	0.7 B	1.4	mg/kg	P-26_06/15/1999_0_0.17	2/5	0.53-0.86	1.4	1.10	511	N	510.99	N	Reg IX PRG (ind)	N	BSL
	7440-23-5	Sodium	937	937	mg/kg	P-26_06/15/1999_0_0.17	1/5	19.4-58.7	937	118	NV		NV			N	NUT
	7440-28-0	Thallium	3.9	3.9	mg/kg	P-26_06/15/1999_0_0.17	1/5	0.82-1.7	3.9	1.50	7.15	N	6.75	N	Reg IX PRG (ind)	N	BSL
	7440-62-2	Vanadium	7.4	62.8	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	62.8	61.20	715.40	N	715.39	N	Reg IX PRG (ind)	N	BSL
	7440-66-6	Zinc	7.3 B	83.9	mg/kg	P-34_08/16/1999_0_0.17	5/5	NA	83.9	31.30	30660	N	10000	max	Reg IX PRG (ind)	N	BSL

Table 2-14
Selection of Chemicals of Potential Concern
AOC BP: Soil-surface 0-6in (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-surface 0-6in (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	SVOCs																
	56-55-3	Benzo(a)anthracene	0.08 J	0.08 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.08	0.07	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	50-32-8	Benzo(a)pyrene	0.073 J	0.073 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.073	0.05	0.39	C	0.21	C	Reg IX PRG (ind)	N	BSL
	205-99-2	Benzo(b)fluoranthene	0.1 J	0.1 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.1	0.11	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	191-24-2	Benzo(g,h,i)perylene	0.041 J	0.041 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.041	0.05	NV		NV			Y	NV
	207-08-9	Benzo(k)fluoranthene	0.041 J	0.041 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.041	0.04	39.20	C	21.10	C	Reg IX PRG (ind)	N	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	0.14 J	0.14 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.035-0.14	0.14	0.18	204.40	C	123.12	C	Reg IX PRG (ind)	N	BSL
	218-01-9	Chrysene	0.079 J	0.079 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.079	0.08	392	C	210.96	C	Reg IX PRG (ind)	N	BSL
	206-44-0	Fluoranthene	0.15 J	0.15 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.15	0.11	4088	N	2200.04	N	Reg IX PRG (ind)	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.044 J	0.044 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.044	0.05	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	85-01-8	Phenanthrene	0.083 J	0.083 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.083	0.09	NV		NV			Y	NV
	129-00-0	Pyrene	0.096 J	0.096 J	mg/kg	P-34_08/16/1999_0_0.17	1/5	0.017-0.069	0.096	0.11	3066	N	2912.62	N	Reg IX PRG (ind)	N	BSL
	PCBs																
	1336-36-3	Total PCBs	0.055	0.71	mg/kg	P-26_06/15/1999_0_0.17	5/5	NA	0.71	0.01	1.43	C	0.74	C	Reg IX PRG (ind)	N	BSL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) *Background Value obtained from site investigation. Concentration is maximum detected value.*

(3) Screening Toxicity Values are Industrial Region III Soil RBCs . HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = *Below Screening Level*
NV = No toxicity value available: COP
ASL = Above Screening Level
AARAR =*Above Applicable or Relevant and Appropriate Requirements*
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.
E = Estimated due to interference (inorganic qualifier).

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

Table 2-15
Selection of Chemicals of Potential Concern
AOC BP: Soil-subsurface 0-6ft (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-subsurface 0-6ft (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC BP	Metals																
	7429-90-5	Aluminum	949	13700	mg/kg	P-34_08/16/1999_0_0.17	20/20	NA	13700	8450	102200	N	10000	max	Reg IX PRG (ind)	Y	AARAR
	7440-38-2	Arsenic	0.83 B	9.1	mg/kg	P-34_08/16/1999_0_0.17	19/20	0.69-0.69	9.1	13.80	1.91	C	1.59	C	Reg IX PRG (ind)	Y	ASL
	7440-39-3	Barium	4.5 B	329	mg/kg	P-26_06/15/1999_0_0.17	20/20	NA	329	138	7154.00	N	6657.73	N	Reg IX PRG (ind)	N	BSL
	7440-41-7	Beryllium	0.195 B	0.66	mg/kg	L-9B_08/23/1999_5_6	13/20	0.16-0.38	0.66	1.40	204.40	N	1940.69	C	Reg IX PRG (ind)	N	BSL
	7440-43-9	Cadmium	0.21 B	0.98 B	mg/kg	P-26_06/15/1999_4_4.5	5/17	0.17-0.46	0.98	0.71	51.10	N	45.14	N	Reg IX PRG (ind)	N	BSL
	7440-70-2	Calcium	74.2	26800 *	mg/kg	P-26_06/15/1999_4_4.5	20/20	NA	26800	3090	NV		NV			N	NUT
	7440-47-3	Chromium	4.9 J	267	mg/kg	P-26_06/15/1999_4_4.5	21/21	NA	267	50.80	30.66	N	448.32	C	Reg IX PRG (ind)	Y	ASL
	18540-29-9	Chromium (hexavalent)	0.9 J	0.9 J	mg/kg	P-26_09/12/2000_0_1	1/1	NA	0.9	NA	306.60	N	64.05	C	Reg IX PRG (ind)	N	BSL
	7440-48-4	Cobalt	1 B	14.1	mg/kg	P-26_06/15/1999_0_0.17	17/20	0.74-1.2	14.1	5.90	2044	N	1921.35	C	Reg IX PRG (ind)	N	BSL
	7440-50-8	Copper	1.6 B	45	mg/kg	P-26_06/15/1999_0_0.17	20/20	NA	45	10.10	4088	N	4087.67	N	Reg IX PRG (ind)	N	BSL
	7439-89-6	Iron	1370	25600	mg/kg	P-34_08/16/1999_0_0.17	19/20	5.8-5.8	25600	30200	30660	N	10000	max	Reg IX PRG (ind)	Y	AARAR
	7439-92-1	Lead	2.4	95.4	mg/kg	P-34_08/16/1999_0.17_1	19/19	NA	95.4	50.40	NV		75.00	N	Reg IX PRG (ind)	Y	AARAR
	7439-95-4	Magnesium	86.9 NJ	10100 N	mg/kg	P-26_06/15/1999_0_0.17	20/20	NA	10100	1100	NV		NV			N	NUT
	7439-96-5	Manganese	6.5	1230 NJ*	mg/kg	L-9B_08/23/1999_5_6	20/20	NA	1230	110	2044	N	1945.81	N	Reg IX PRG (ind)	N	BSL
	7439-97-6	Mercury	0.007 B	0.14	mg/kg	P-34_08/16/1999_0_0.17	18/20	0.005-0.005	0.14	0.09	1.02	N	0.62	N	Reg IX PRG (ind)	N	BSL
	7440-02-0	Nickel	1.8 B	29.3	mg/kg	P-26_06/15/1999_0_0.17	19/20	1-1	29.3	14.20	2044	N	2043.92	N	Reg IX PRG (ind)	N	BSL
	7440-09-7	Potassium	151 J	2680 *	mg/kg	P-34_08/16/1999_0_0.17	18/20	31.9-31.9	2680	2400	NV		NV			N	NUT
	7782-49-2	Selenium	0.65 B	1.6	mg/kg	P-26_06/15/1999_4_4.5	6/20	0.43-0.86	1.6	1.80	511	N	510.99	N	Reg IX PRG (ind)	N	BSL
	7440-23-5	Sodium	23.7 B	937	mg/kg	P-26_06/15/1999_0_0.17	14/20	18.1-58.7	937	166	NV		NV			N	NUT
	7440-28-0	Thallium	0.94 B	3.9	mg/kg	P-26_06/15/1999_0_0.17	8/20	0.71-1.7	3.9	1.50	7.15	N	6.75	N	Reg IX PRG (ind)	N	BSL
	7440-62-2	Vanadium	6.9	121	mg/kg	P-26_06/15/1999_4_4.5	20/20	NA	121	61.20	715.40	N	715.39	N	Reg IX PRG (ind)	N	BSL
	7440-66-6	Zinc	5.5 B	83.9	mg/kg	P-34_08/16/1999_0_0.17	20/20	NA	83.9	67.70	30660	N	10000	max	Reg IX PRG (ind)	N	BSL

800196

Table 2-15
Selection of Chemicals of Potential Concern
AOC BP: Soil-subsurface 0-6ft (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-subsurface 0-6ft (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	SVOCs																
	105-67-9	2,4-Dimethylphenol	0.012	0.012	mg/kg	P-26_06/15/1999_4_4.5	1/21	0.034-0.14	0.012	ND	2044	N	1231.21	N	Reg IX PRG (ind)	N	FOD
	91-57-6	2-Methylnapthalene	0.038 J	11	mg/kg	P-26_06/15/1999_4_4.5	6/21	0.017-0.069	11	ND	2044	N	NV			N	BSL
	106-44-5	4-Methylphenol	0.014	0.11 J	mg/kg	P-26_06/15/1999_4_4.5	3/21	0.034-0.14	0.11	ND	511	N	307.80	N	Reg IX PRG (ind)	N	BSL
	83-32-9	Acenaphthene	0.002 J	0.61	mg/kg	P-26_06/15/1999_4_4.5	5/21	0.017-0.069	0.61	ND	6132	N	2921.93	N	Reg IX PRG (ind)	N	BSL
	208-96-8	Acenaphthylene	0.086 J	0.2	mg/kg	P-26_06/15/1999_4_4.5	2/21	0.001-0.069	0.2	ND	NV		NV			Y	NV
	120-12-7	Anthracene	0.048 J	0.19	mg/kg	P-26_06/15/1999_4_4.5	5/21	0.001-0.069	0.19	ND	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	56-55-3	Benzo(a)anthracene	0.054 J	0.18 J	mg/kg	P-43_06/08/1999_4_4.5	6/21	0.001-0.069	0.18	0.07	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	50-32-8	Benzo(a)pyrene	0.038 J	0.22 J	mg/kg	P-43_06/08/1999_4_4.5	6/21	0.001-0.069	0.22	0.05	0.39	C	0.21	C	Reg IX PRG (ind)	Y	AARAR
	205-99-2	Benzo(b)fluoranthene	0.038 J	0.21 J	mg/kg	P-43_06/08/1999_4_4.5	8/21	0.001-0.069	0.21	0.11	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	191-24-2	Benzo(g,h,i)perylene	0.041 J	0.15 J	mg/kg	P-43_06/08/1999_4_4.5	6/21	0.001-0.069	0.15	0.05	NV		NV			Y	NV
	207-08-9	Benzo(k)fluoranthene	0.04 J	0.065 J	mg/kg	L-11B_08/10/1999_4_5	4/21	0.001-0.069	0.065	0.04	39.20	C	21.10	C	Reg IX PRG (ind)	N	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	0.093 J	1	mg/kg	P-43_06/08/1999_4_4.5	6/21	0.002-0.14	1	1.30	204.40	C	123.12	C	Reg IX PRG (ind)	N	BSL
	85-68-7	Butyl benzyl phthalate	0.3 J	0.3 J	mg/kg	L-9B_08/23/1999_5_6	1/21	0.002-0.14	0.3	0.47	20440	N	10000	max	Reg IX PRG (ind)	N	FOD
	218-01-9	Chrysene	0.037 J	0.27 J	mg/kg	P-43_06/08/1999_4_4.5	8/21	0.001-0.069	0.27	0.08	392.00	C	210.96	C	Reg IX PRG (ind)	N	BSL
	132-64-9	Dibenzofuran	0.001 J	0.33	mg/kg	P-26_06/15/1999_4_4.5	4/21	0.017-0.069	0.33	ND	204.40	N	312.67	N	Reg IX PRG (ind)	N	BSL
	84-74-2	Di-n-butyl phthalate	0.082 J	0.082 J	mg/kg	P-26_06/15/1999_4_4.5	1/21	0.002-0.14	0.082	ND	10220	N	6156.06	N	Reg IX PRG (ind)	N	FOD
	206-44-0	Fluoranthene	0.044 J	0.33 J	mg/kg	P-43_06/08/1999_4_4.5	8/21	0.001-0.069	0.33	0.11	4088	N	2200.04	N	Reg IX PRG (ind)	N	BSL
	86-73-7	Fluorene	0.003 J	0.82	mg/kg	P-26_06/15/1999_4_4.5	5/21	0.017-0.069	0.82	0.16	4088	N	2628.14	N	Reg IX PRG (ind)	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	0.044 J	0.13 J	mg/kg	P-43_06/08/1999_4_4.5	4/21	0.001-0.069	0.13	0.05	3.92	C	2.11	C	Reg IX PRG (ind)	N	BSL
	91-20-3	Naphthalene	0.046	2.2	mg/kg	P-26_06/15/1999_4_4.5	4/21	0.017-0.069	2.2	ND	2044	N	18.77	N	Reg IX PRG (ind)	N	BSL
	85-01-8	Phenanthrene	0.009 J	1.7	mg/kg	P-26_06/15/1999_4_4.5	7/21	0.017-0.069	1.7	0.09	NV		NV			Y	NV
	108-95-2	Phenol	0.002 J	0.091 J	mg/kg	P-43_06/08/1999_4_4.5	2/21	0.034-0.14	0.091	ND	30660	N	10000	max	Reg IX PRG (ind)	N	BSL
	129-00-0	Pyrene	0.001 J	0.63	mg/kg	P-43_06/08/1999_4_4.5	10/21	0.017-0.069	0.63	0.11	3066	N	2912.62	N	Reg IX PRG (ind)	N	BSL

Table 2-15
Selection of Chemicals of Potential Concern
AOC BP: Soil-subsurface 0-6ft (industrial)
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Soil-subsurface 0-6ft (industrial)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	VOCs																
	120-82-1	1,2,4-Trichlorobenzene	0.003 J	0.98	mg/kg	P-26_06/15/1999_4_4.5	3/21	0.017-0.069	0.98	ND	1022	N	300	sat	Reg IX PRG (ind)	N	BSL
	95-50-1	1,2-Dichlorobenzene	0.005 J	0.26	mg/kg	P-26_06/15/1999_4_4.5	2/21	0.017-0.069	0.26	ND	9198	N	37	sat	Reg IX PRG (ind)	N	BSL
	106-46-7	1,4-Dichlorobenzene	0.037 J	0.037 J	mg/kg	P-26_06/15/1999_4_4.5	1/21	0.001-0.069	0.037	ND	119.23	C	7.87	C	Reg IX PRG (ind)	N	FOD
	78-93-3	2-Butanone	0.039 J	0.046 J	mg/kg	PB-5_06/18/1999_3_4	2/9	0.003-0.94	0.046	ND	61320	N	2710.20	N	Reg IX PRG (ind)	N	BSL
	67-64-1	Acetone	0.008 J	0.29 J	mg/kg	PB-5_06/18/1999_3_4	3/8	0.006-1.6	0.29	0.01	10000	N	603.60	N	Reg IX PRG (ind)	N	BSL
	71-43-2	Benzene	0.005 J	0.013	mg/kg	P-26_06/15/1999_4_4.5	2/9	0.001-0.23	0.013	ND	52.03	C	1.31	C	Reg IX PRG (ind)	N	BSL
	75-15-0	Carbon disulfide	0.002 J	0.002 J	mg/kg	P-26_06/15/1999_4_4.5	1/8	0.003-0.23	0.002	ND	10220	N	72	sat	Reg IX PRG (ind)	N	BSL
	108-90-7	Chlorobenzene	0.002 J	0.026 J	mg/kg	P-43_06/08/1999_4_4.5	3/9	0.001-0.23	0.026	ND	2044	N	53.05	N	Reg IX PRG (ind)	N	BSL
	67-66-3	Chloroform	0.002 J	0.002 J	mg/kg	PB-5_06/18/1999_3_4	1/9	0.001-0.23	0.002	0.00	1022	N	11.68	C	Reg IX PRG (ind)	N	BSL
	156-59-2	cis-1,2-Dichloroethene	0.008	0.008	mg/kg	P-26_06/15/1999_4_4.5	1/8	0.002-0.23	0.008	ND	1022	N	14.63	N	Reg IX PRG (ind)	N	BSL
	100-41-4	Ethylbenzene	0.005 J	0.091	mg/kg	P-26_06/15/1999_4_4.5	3/8	0.001-0.23	0.091	ND	10220	N	19.53	C	Reg IX PRG (ind)	N	BSL
	75-09-2	Methylene chloride	0.009	0.009	mg/kg	P-26_06/15/1999_4_4.5	1/8	0.002-0.47	0.009	0.04	381.55	C	20.53	C	Reg IX PRG (ind)	N	BSL
	127-18-4	Tetrachloroethene	0.012	0.012	mg/kg	P-26_06/15/1999_4_4.5	1/9	0.001-0.23	0.012	ND	5.30	C	3.42	C	Reg IX PRG (ind)	N	BSL
	108-88-3	Toluene	0.006 J	0.38 DB	mg/kg	P-26_06/15/1999_4_4.5	3/8	0.001-0.23	0.38	0.03	20440	N	52	sat	Reg IX PRG (ind)	N	BSL
	79-01-6	Trichloroethene	0.013	0.013	mg/kg	P-26_06/15/1999_4_4.5	1/9	0.001-0.23	0.013	ND	7.15	C	0.11	C	Reg IX PRG (ind)	N	BSL
	1330-20-7	Xylenes (Total)	0.042 J	0.44	mg/kg	P-26_06/15/1999_4_4.5	3/8	0.001-0.23	0.44	ND	20440	N	42	sat	Reg IX PRG (ind)	N	BSL
	PCBs																
	1336-36-3	Total PCBs	0.007	9.8 P	mg/kg	P-26_06/15/1999_4_4.5	20/21	0.011-0.011	9.8	0.07	1.43	C	0.74	C	Reg IX PRG (ind)	Y	ASL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Industrial Region III Soil RBCs . HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800198

Table 2-16
Selection of Chemicals of Potential Concern
AOC 1a: Shallow Groundwater
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Ground water
Exposure Medium:	Shallow Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value (4)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
AOC 1a	**Metals**															
	7429-90-5	Aluminum	35.8 B	524000 E	ug/l	MW-26S_01/12/2000_N	16/19	77-77	524000	220	3649.87	N	200	NJ GW	Y	ASL
	7440-38-2	Arsenic	8 B	536	ug/l	MW-25S_01/13/2000_N	9/17	5-50	536	ND	0.04	C	0.02	NJ GW	Y	ASL
	7440-39-3	Barium	9.5 B	1200	ug/l	MW-25S_01/13/2000_N	17/17	NA	1200	41.70	255.50	N	2000	NJ GW	Y	ASL
	7440-41-7	*Beryllium*	4.3 B	59.2	ug/l	MW-26S_01/12/2000_N	4/17	1.9-1.9	59.2	ND	7.30	N	0.008	NJ GW	Y	ASL
	7440-70-2	Calcium	3620 E	369000 E	ug/l	MW-26S_01/12/2000_N	17/17	NA	369000	7830	NV		NV		N	NUT
	7440-47-3	Chromium	40.6	1090	ug/l	MW-25S_01/13/2000_N	6/17	6.6-9.8	1090	ND	1.095	N	100	NJ GW	Y	ASL
	7440-48-4	Cobalt	7.2 B	351	ug/l	MW-26S_01/12/2000_N	5/17	6.6-7.1	351	ND	73.00	N	NV		Y	ASL
	7440-50-8	Copper	5.5 B	508	ug/l	MW-25S_01/13/2000_N	5/17	2.7-17.5	508	ND	146.00	N	1000	NJ GW	Y	ASL
	7439-89-6	Iron	25.2 B	3900000	ug/l	MW-26S_01/12/2000_T	16/16	NA	3900000	1800	1094.99	N	300	NJ GW	N	NUT
	7439-92-1	Lead	9.1 B	790	ug/l	MW-25S_01/13/2000_N	6/17	7.9-9.8	790	ND	NV		5	NJ GW	Y	AARAR
	7439-95-4	Magnesium	537 E	317000	ug/l	MW-26S_01/12/2000_N	17/17	NA	317000	4640	NV		NV		N	NUT
	7439-96-5	Manganese	15.8 E	43900	ug/l	MW-26S_01/12/2000_N	19/19	NA	43900	121.00	73	N	50	NJ GW	N	NUT
	7439-97-6	Mercury	1.6 B	1.6 B	ug/l	MW-25S_01/13/2000_N	1/17	0.1-0.12	1.6	ND	0.04	N	2	NJ GW	Y	ASL
	7440-02-0	Nickel	8.8 B	2080	ug/l	MW-26S_01/12/2000_N	7/17	6.6-8.4	2080	ND	73.00	N	100	NJ GW	Y	ASL
	7440-09-7	*Potassium*	1890 D	107000 J	ug/l	MW-26S_01/12/2000_N	17/17	NA	107000	7860	NV		NV		N	NUT
	7782-49-2	Selenium	4.5 B	332	ug/l	MW-26S_01/12/2000_N	3/17	3.5-22	332	ND	18.25	N	50	NJ GW	Y	ASL
	7440-23-5	Sodium	1815 E*J	559000	ug/l	MW-26S_01/12/2000_N	17/17	NA	559000	NA	NV		50000	NJ GW	N	NUT
	7440-28-0	Thallium	97.4 B	387	ug/l	MW-26S_01/12/2000_N	3/17	9.2-10.1	387	ND	0.24	N	0.5	NJ GW	Y	ASL
	7440-62-2	Vanadium	2.7 B	2700	ug/l	MW-25S_01/13/2000_N	9/17	2.6-3.4	2700	ND	25.55	N	NV		Y	ASL
	7440-66-6	Zinc	5.8 BE	1640	ug/l	MW-26S_01/12/2000_N	15/17	8.6-8.6	1640	NA	1094.99	N	5000	NJ GW	Y	ASL
	SVOCs															
	105-67-9	2,4-Dimethylphenol	1 J	150	ug/l	P-5_11/30/2000_N	2/4	1-1	150	NA	73.00	N	100	NJ GW	Y	ASL
	91-57-6	2-Methylnapthalene	1 J	120	ug/l	MW-26S_01/12/2000_N	4/14	0.9-1	120	ND	12.17	N	NV		Y	ASL
	95-48-7	2-Methylphenol	1 J	1 J	ug/l	P-5_11/30/2000_N	1/4	0.9-1	1	NA	182.50	N	NV		N	BSL
	99-09-2	3-Nitroaniline	2 J	3 J	ug/l	MW-1A_10/31/2000_	2/14	2-2	3	ND	NV		NV		Y	NV
	59-50-7	4-Chloro-3-methylphenol	1 J	1 J	ug/l	P-5_11/30/2000_N	1/4	0.9-1	1	NA	NV		NV		Y	NV
	106-47-8	4-Chloroaniline	2250 D	2250 D	ug/l	MW-32S_01/14/2000_N	1/14	0.9-1	2250	ND	14.60	N	NV		Y	ASL
	108-10-1	4-Methyl-2-pentanone	270	820	ug/l	MW-26S_01/12/2000_N	3/20	3-10	820	ND	15.78	N	NV		Y	ASL
	106-44-5	4-Methylphenol	8 J	8 J	ug/l	P-5_11/30/2000_N	1/4	3-3	8	NA	18.25	N	NV		N	BSL
	83-32-9	Acenaphthene	1 J	6 J	ug/l	MW-32S_01/14/2000_N	5/14	0.9-1	6	ND	36.5	N	400	NJ GW	N	BSL

800199

Table 2-16
Selection of Chemicals of Potential Concern
AOC 1a: Shallow Groundwater
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Ground water
Exposure Medium:	Shallow Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value (4)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	208-96-8	Acenaphthylene	12	12	ug/l	MW-26S_01/12/2000_N	1/14	0.9-1	12	ND	NV		NV		Y	NV
	120-12-7	Anthracene	7 J	7 J	ug/l	MW-26S_01/12/2000_N	1/14	0.9-1	7	ND	182.5	N	2000	NJ GW	N	BSL
	56-55-3	Benzo(a)anthracene	3 J	3 J	ug/l	MW-26S_01/12/2000_N	1/14	0.9-1	3	ND	0.09	C	NV		Y	ASL
	50-32-8	Benzo(a)pyrene	3 J	3 J	ug/l	MW-26S_01/12/2000_N	1/14	0.9-1	3	ND	0.01	C	0.2	MCL	Y	ASL
	205-99-2	Benzo(b)fluoranthene	2 J	2 J	ug/l	MW-26S_01/12/2000_N	1/14	0.9-1	2	ND	0.09	C	NV		Y	ASL
	191-24-2	Benzo(g,h,i)perylene	2 J	2 J	ug/l	MW-26S_01/12/2000_N	1/14	0.9-1	2	ND	NV		NV		Y	NV
	111-44-4	bis(2-Chloroethyl)ether	1 J	1800	ug/l	MW-26S_01/12/2000_N	6/14	0.9-1	1800	ND	0.01	C	0.03	NJ GW	Y	ASL
	117-81-7	bis(2-Ethylhexyl)phthalate	3 J	18	ug/l	MW-26S_01/12/2000_N	6/14	2-2	18	ND	4.78	C	3	NJ GW	Y	ASL
	85-68-7	Butyl benzyl phthalate	2 JN	14	ug/l	MW-26S_01/12/2000_N	2/14	2-4	14	ND	729.99	N	100	NJ GW	N	BSL
	218-01-9	Chrysene	1 J	4 J	ug/l	MW-26S_01/12/2000_N	2/14	0.9-1	4	ND	9.17	C	NV		N	BSL
	132-64-9	Dibenzofuran	1 J	3 J	ug/l	MW-26S_01/12/2000_N	2/14	0.9-1	3	ND	1.22	N	NV		Y	ASL
	84-66-2	Diethyl phthalate	2 J	2 J	ug/l	MW-32S_01/14/2000_N	1/14	2-2	2	ND	2919.91	N	5000	NJ GW	N	BSL
	84-74-2	Di-n-butyl phthalate	3 J	3 J	ug/l	MW-26S_01/12/2000_N	1/14	2-2	3	ND	365.00	N	900	NJ GW	N	BSL
	117-84-0	Di-n-octyl phthalate	2 J	2 J	ug/l	P-5_11/30/2000_N	1/14	2-2	2	ND	73	N	100	NJ GW	N	BSL
	206-44-0	Fluoranthene	1 J	8 J	ug/l	MW-26S_01/12/2000_N	3/14	0.9-1	8	ND	146.00	N	300	NJ GW	N	BSL
	86-73-7	Fluorene	1 J	12	ug/l	MW-26S_01/12/2000_N	6/14	0.9-1.5	12	ND	24.33	N	300	NJ GW	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	1 J	1 J	ug/l	MW-26S_01/12/2000_N	1/14	0.9-1	1	ND	0.09	C	NV		Y	ASL
	78-59-1	Isophorone	27	390 D	ug/l	MW-26S_01/12/2000_N	2/14	0.9-1	390	ND	70.50	C	100	NJ GW	Y	ASL
	91-20-3	Naphthalene	2	290 D	ug/l	MW-26S_01/12/2000_N	3/13	0.9-1	290	ND	0.62	N	NV		Y	ASL
	86-30-6	n-Nitrosodiphenylamine	1 J	7 J	ug/l	MW-30S_01/10/2000_N	4/14	0.9-1	7	ND	13.67	C	7	NJ GW	N	BSL
	85-01-8	Phenanthrene	1.5 J	36	ug/l	MW-26S_01/12/2000_N	4/14	0.9-1	36	ND	NV		NV		Y	NV
	108-95-2	Phenol	2 J	2 J	ug/l	P-5_11/30/2000_N	1/4	0.9-1	2	NA	1095	N	4000	NJ GW	N	BSL
	129-00-0	Pyrene	1 J	11 J	ug/l	MW-26S_01/12/2000_N	4/14	0.9-1	11	ND	18.25	N	200	NJ GW	N	BSL
	VOCs															
	71-55-6	1,1,1-Trichloroethane	51	170	ug/l	MW-32S_01/14/2000_N	3/20	1-2	170	ND	317.17	N	30	NJ GW	Y	AARAR
	79-00-5	1,1,2-Trichloroethane	3 J	3 J	ug/l	MW-26S_05/03/2001_N	1/20	1-30	3	ND	0.19	C	3	NJ GW	N	FOD
	75-34-3	1,1-Dichloroethane	3 J	310	ug/l	MW-32S_01/14/2000_N	5/20	1-4	310	ND	79.84	N	70	NJ GW	Y	ASL
	75-35-4	1,1-Dichloroethene	5 J	5 J	ug/l	MW-26S_05/03/2001_N	1/20	1-16.5	5	ND	33.88	N	1	NJ GW	N	FOD
	120-82-1	1,2,4-Trichlorobenzene	1.5 J	6 J	ug/l	MW-26S_01/12/2000_N	6/14	0.9-1	6	ND	0.72	N	9	NJ GW	Y	ASL
	95-50-1	1,2-Dichlorobenzene	1 J	18	ug/l	MW-32S_01/14/2000_N	7/14	0.9-1	18	ND	26.82	N	600	NJ GW	N	BSL
	107-06-2	1,2-Dichloroethane	5 J	150	ug/l	MW-26S_01/12/2000_N	5/20	1-4	150	ND	0.12	C	0.3	NJ GW	Y	ASL
	78-87-5	1,2-Dichloropropane	7	10 J	ug/l	MW-26S_01/12/2000_N	2/20	1-15	10	ND	0.16	C	0.5	NJ GW	Y	ASL
	541-73-1	1,3-Dichlorobenzene	1 J	1 J	ug/l	MW-24S_11/30/2000_N	1/14	0.9-1	1	ND	0.55	N	600	NJ GW	Y	ASL

800200

Table 2-16
Selection of Chemicals of Potential Concern
AOC 1a: Shallow Groundwater
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Ground water
Exposure Medium:	Shallow Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value (4)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	106-46-7	1,4-Dichlorobenzene	1 J	2 J	ug/l	MW-24S_11/30/2000_N	3/14	0.9-1	2	ND	0.47	C	75	NJ GW	Y	ASL
	78-93-3	2-Butanone	6 J	1300	ug/l	MW-26S_01/12/2000_N	4/20	3-45	1300	ND	190.43	N	300	NJ GW	Y	ASL
	591-78-6	2-Hexanone	21 J	61	ug/l	MW-32S_01/14/2000_N	2/20	3-70	61	ND	146	N	NV		N	BSL
	67-64-1	Acetone	8 J	6600	ug/l	MW-26S_01/12/2000_N	7/20	6-26	6600	ND	60.83	N	700	NJ GW	Y	ASL
	71-43-2	Benzene	1 J	915	ug/l	MW-32S_01/14/2000_N	14/20	1-1	915	ND	0.34	C	0.2	NJ GW	Y	ASL
	75-15-0	Carbon disulfide	130	130	ug/l	MW-26S_05/03/2001_N	2/20	1-30	130	ND	104.29	N	NV		Y	ASL
	108-90-7	Chlorobenzene	4 J	280 J	ug/l	MW-30S_01/10/2000_N	3/20	1-5	280	ND	10.61	N	4	NJ GW	Y	ASL
	75-00-3	Chloroethane	2 J	94	ug/l	MW-26S_01/12/2000_N	3/20	2-30	94	ND	3.64	C	NV		Y	ASL
	67-66-3	Chloroform	15	98.5	ug/l	MW-32S_01/14/2000_N	3/20	1-2	98.5	ND	0.15	C	6	NJ GW	Y	ASL
	74-87-3	Chloromethane	6 J	6 J	ug/l	MW-26S_05/03/2001_N	1/20	2-45	6	ND	1.51	C	30	NJ GW	N	FOD
	156-59-2	cis-1,2-Dichloroethene	1 J	16500 D	ug/l	MW-32S_01/14/2000_N	6/20	1-2	16500	ND	6.08	N	10	NJ GW	Y	ASL
	100-41-4	Ethylbenzene	1 J	655	ug/l	MW-32S_01/14/2000_N	9/20	1-4	655	ND	2.91	C	700	NJ GW	Y	ASL
	75-09-2	Methylene chloride	170	310	ug/l	MW-26S_01/12/2000_N	2/20	2-30	310	ND	4.10	C	2	NJ GW	Y	ASL
	127-18-4	Tetrachloroethene	1 J	35	ug/l	MW-26S_01/12/2000_N	4/20	1-17.5	35	ND	0.10	C	0.4	NJ GW	Y	ASL
	108-88-3	Toluene	2 J	2500	ug/l	MW-32S_01/14/2000_N	8/20	1-4	2500	ND	72.34	N	1000	NJ GW	Y	ASL
	156-60-5	trans-1,2-Dichloroethene	3 J	78 J	ug/l	MW-32S_01/14/2000_N	2/20	1-10	78	ND	12.17	N	100	NJ GW	Y	ASL
	79-01-6	Trichloroethene	3 J	590	ug/l	MW-32S_01/14/2000_N	4/20	1-1	590	ND	0.03	C	1	NJ GW	Y	ASL
	75-01-4	Vinyl chloride	1 J	240	ug/l	MW-32S_01/14/2000_N	4/20	1-4	240	ND	0.015	C	0.08	NJ GW	Y	ASL
	1330-20-7	Xylenes (Total)	1 J	3000	ug/l	MW-32S_01/14/2000_N	12/20	1-1	3000	ND	21.00	N	40	NJ GW	Y	ASL
	PCBs															
	1336-36-3	Total PCBs	0.46 J	264	ug/l	P-5_11/30/2000_N	4/4	NA	264	NA	0.03	C	0.02	NJ GW	Y	ASL

(1) The maximum detected concentration is used as the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are the lower of Region III RBCs and Region IX PRGs (Tap Water). HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) ARAR values are the lower of New Jersey Groundwater Criteria and USEPA MCLs.

(5) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated
FOD = Detection Frequency < 5%

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.
E = Estimated due to interference (inorganic qualifier).
D= Compound quantitated on a diluted sample.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800201

Table 2-17
Selection of Chemicals of Potential Concern
AOC 1b: Shallow Groundwater
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Ground water
Exposure Medium:	Shallow Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value (4)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
AOC 1b	Metals															
	7429-90-5	Aluminum	855 J	855 J	ug/l	MW-3A_07/12/1999_N	1/1	NA	855	220	3649.87	N	200	NJ GW	Y	AARAR
	7440-39-3	Barium	29.8 B	29.8 B	ug/l	MW-3A_07/12/1999_N	1/1	NA	29.8	41.70	255.50	N	2000	NJ GW	N	BSL
	7440-70-2	Calcium	15100	15100	ug/l	MW-3A_07/12/1999_N	1/1	NA	15100	7830	NV		NV		N	NUT
	7439-89-6	Iron	*1680 J*	*1680 J*	ug/l	MW-3A_07/12/1999_N	1/1	NA	1680	1800	1094.99	N	300	NJ GW	N	NUT
	7439-95-4	Magnesium	3880	3880	ug/l	MW-3A_07/12/1999_N	1/1	NA	3880	4840	NV		NV		N	NUT
	7439-96-5	Manganese	174	174	ug/l	MW-3A_07/12/1999_N	1/1	NA	174	121	73	N	50	NJ GW	N	NUT
	7440-02-0	Nickel	7.6 B	7.6 B	ug/l	MW-3A_07/12/1999_N	1/1	NA	7.6	ND	73.00	N	100	NJ GW	N	BSL
	7440-09-7	Potassium	3330	3330	ug/l	MW-3A_07/12/1999_N	1/1	NA	3330	7860	NV		NV		N	NUT
	7440-23-5	Sodium	8560	8560	ug/l	MW-3A_07/12/1999_N	1/1	NA	8560	NA	NV		50000	NJ GW	N	NUT
	7440-28-0	Thallium	13.3 J	13.3 J	ug/l	MW-3A_07/12/1999_N	1/1	NA	13.3	ND	0.24	N	0.5	NJ GW	Y	ASL
	7440-66-6	Zinc	21.6 J	21.6 J	ug/l	MW-3A_07/12/1999_N	1/1	NA	21.6	NA	1094.99	N	5000	NJ GW	N	BSL

(1) The maximum detected concentration is used as the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are the lower of Region III RBCs and Region IX PRGs (Tap Water). HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) ARAR values are the lower of New Jersey Groundwater Criteria and USEPA MCLs.

(5) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

Table 2-18
Selection of Chemicals of Potential Concern
AOC 1c: Shallow Groundwater
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Groundwater
Exposure Medium:	Shallow Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value (4)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
AOC 1c	**Metals**															
	7429-90-5	Aluminum	35.7 B	35.7 B	ug/l	MW-4A_04/30/2001_T	1/2	77-77	35.7	220	3649.87	N	200	NJ GW	N	BSL
	7440-38-2	Arsenic	9.1 B	9.1 B	ug/l	MW-4A_01/07/2000_N	1/1	NA	9.1	ND	0.04	C	0.02	NJ GW	Y	ASL
	7440-39-3	Barium	54.5 B	54.5 B	ug/l	MW-4A_01/07/2000_N	1/1	NA	54.5	41.70	255.50	N	2000	NJ GW	N	BSL
	7440-70-2	Calcium	18300 J	18300 J	ug/l	MW-4A_01/07/2000_N	1/1	NA	18300	7830.00	NV		NV		N	NUT
	7440-48-4	Cobalt	14.4 B	14.4 B	ug/l	MW-4A_01/07/2000_N	1/1	NA	14.4	ND	73.00	N	NV		N	BSL
	7440-50-8	Copper	7.7 B	7.7 B	ug/l	MW-4A_01/07/2000_N	1/1	NA	7.7	ND	146.00	N	1000	NJ GW	N	BSL
	7439-89-6	Iron	36400	57200	ug/l	MW-4A_04/30/2001_T	2/2	NA	*57200*	*1800*	*1094.99*	*N*	*300*	NJ GW	N	*NUT*
	7439-95-4	Magnesium	6170	6170	ug/l	MW-4A_01/07/2000_N	1/1	NA	6170	4640	NV		NV		N	NUT
	7439-96-5	Manganese	2000 *	2910	ug/l	MW-4A_04/30/2001_T	2/2	NA	2910	121	73.00	N	50	NJ GW	N	NUT
	7440-09-7	Potassium	2920 *	2920 *	ug/l	MW-4A_01/07/2000_N	1/1	NA	2920	7860	NV		NV		N	NUT
	7440-23-5	Sodium	27200	27200	ug/l	MW-4A_01/07/2000_N	1/1	NA	27200	NA	NV		50000	NJ GW	N	NUT
	7440-62-2	Vanadium	5	5	ug/l	MW-4A_01/07/2000_N	1/1	NA	5	ND	25.55	N	NV		N	BSL
	7440-66-6	Zinc	6.4	6.4	ug/l	MW-4A_01/07/2000_N	1/1	NA	6.4	NA	1094.99	N	5000	NJ GW	N	BSL

(1) The maximum detected concentration is used as the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are the lower of Region III RBCs and Region IX PRGs (Tap Water). HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) ARAR values are the lower of New Jersey Groundwater Criteria and USEPA MCLs.

(5) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available; COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = *Duplicate analysis not within control limits.*
P = Concentration difference between primary and confirmation columns >
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800203

Table 2-19
Selection of Chemicals of Potential Concern
AOC 3: Deep Groundwater
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Ground water
Exposure Medium:	Deep Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value (4)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
AOC 3	**Metals**															
	7429-90-5	Aluminum	54.7 B	473000 *J	ug/l	MW-26D_01/12/2000_N	19/21	77-77	473000	220	3649.87	N	200	NJ GW	Y	ASL
	7440-38-2	Arsenic	5.5 B	9.6 B	ug/l	MW-26D_01/12/2000_N	5/13	5-5	9.6	ND	0.04	C	0.02	NJ GW	Y	ASL
	7440-39-3	Barium	15.4 B	94.7 B	ug/l	MW-5B_01/06/2000_N	13/13	NA	94.7	42	255.50	N	2000	NJ GW	N	BSL
	7440-41-7	Beryllium	3.5 B	21.6	ug/l	MW-26D_01/12/2000_N	8/13	1.9-1.9	21.6	ND	7.30	N	0.01	NJ GW	Y	ASL
	7440-70-2	Calcium	7580 J	106000	ug/l	MW-23D_01/13/2000_N	13/13	NA	106000	7,830	NV		NV		N	NUT
	7440-47-3	Chromium	16.7 B	969	ug/l	MW-26D_01/12/2000_N	6/13	9.8-9.8	969	ND	1.10	N	100	NJ GW	Y	ASL
	7440-48-4	Cobalt	6.9 B	104	ug/l	MW-22D_01/10/2000_N	13/13	NA	104	ND	73.0	N	NV		Y	ASL
	7440-50-8	Copper	4.4 B	117	ug/l	S-2C_01/13/2000_N	8/12	3.5-3.5	117	ND	146.0	N	1000	NJ GW	N	BSL
	7439-89-6	Iron	198	751000	ug/l	MW-26D_05/04/2001_T	27/27	NA	751000	1,800	1094.99	N	300	NJ GW	N	NUT
	7439-92-1	Lead	53.3	147	ug/l	S-3C_01/11/2000_N	5/13	7.9-39.5	147	ND	NV		5	NJ GW	Y	AARAR
	7439-95-4	Magnesium	3620	70600	ug/l	MW-26D_01/12/2000_N	13/13	NA	70600	4,640	NV		NV		N	NUT
	7439-96-5	Manganese	112	6780	ug/l	S-11C_05/04/2001_T	29/29	NA	6780	121	73	N	50	NJ GW	N	NUT
	7440-02-0	Nickel	9.1 B	451	ug/l	MW-26D_01/12/2000_N	13/13	NA	451	ND	73.0	N	100	NJ GW	Y	ASL
	7440-09-7	Potassium	2360	52800	ug/l	MW-23D_01/13/2000_N	13/13	NA	52800	7,860	NV		NV		N	NUT
	7782-49-2	Selenium	18.6	37.9	ug/l	MW-26D_01/12/2000_N	4/13	4.4-22	37.9	ND	18.25	N	50	NJ GW	Y	ASL
	7440-23-5	Sodium	5180 E*J	159000	ug/l	MW-26D_01/12/2000_T	12/12	NA	159000	NA	NV		50000	NJ GW	N	NUT
	7440-28-0	Thallium	33.8	70.4 B	ug/l	MW-26D_01/12/2000_T	4/13	9.2-46	70.4	ND	0.24	N	0.50	NJ GW	Y	ASL
	7440-62-2	Vanadium	17.8 B	2080	ug/l	MW-23D_01/13/2000_N	10/13	3.4-3.4	2080	ND	25.55	N	NV		Y	ASL
	7440-66-6	Zinc	24.8 B	38100	ug/l	S-3C_01/11/2000_N	13/13	NA	38100	NA	1094.99	N	5000	NJ GW	Y	ASL

Table 2-19
Selection of Chemicals of Potential Concern
AOC 3: Deep Groundwater
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Ground water
Exposure Medium:	Deep Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value (4)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	SVOCs															
	91-57-6	2-Methylnapthalene	4 J	10	ug/l	MW-26D_01/12/2000_N	3/11	0.9-1	10	ND	12.17	N	NV		N	BSL
	106-47-8	4-Chloroaniline	6 J	72	ug/l	S-11C_01/14/2000_N	3/11	0.9-1	72	ND	14.60	N	NV		Y	ASL
	108-10-1	4-Methyl-2-pentanone	57 J	6500	ug/l	MW-26D_01/12/2000_N	11/31	3-5	6500	ND	15.78	N	NV		Y	ASL
	111-44-4	bis(2-Chloroethyl)ether	1 J	3800 D	ug/l	MW-27D_01/10/2000_N	11/11	NA	3800	ND	0.01	C	0.03	NJ GW	Y	ASL
	117-81-7	bis(2-Ethylhexyl)phthalate	2 J	2 J	ug/l	MW-26D_01/12/2000_N	1/11	2-2	2	ND	4.78	C	3	NJ GW	N	BSL
	84-66-2	Diethyl phthalate	4 J	8 J	ug/l	MW-26D_01/12/2000_N	4/11	2-2	8	ND	2919.91	N	5000	NJ GW	N	BSL
	131-11-3	Dimethyl phthalate	3 J	3 J	ug/l	MW-23D_01/13/2000_N	1/11	2-2	3	ND	36486.68	N	NV		N	BSL
	84-74-2	Di-n-butyl phthalate	3 J	3 J	ug/l	MW-27D_01/10/2000_N	1/11	2-2	3	ND	365.00	N	900	NJ GW	N	BSL
	78-59-1	Isophorone	8 J	2300 D	ug/l	MW-26D_01/12/2000_N	7/11	0.9-1	2300	ND	70.50	C	100	NJ GW	Y	ASL
	91-20-3	Naphthalene	1 J	44	ug/l	S-11C_01/14/2000_N	5/11	0.9-1	44	ND	0.62	N	NV		Y	ASL
	98-95-3	Nitrobenzene	1 J	1 J	ug/l	MW-4D_01/07/2000_N	1/11	0.9-34	1	ND	0.34	N	3	NJ GW	Y	ASL
	85-01-8	Phenanthrene	1 J	1 J	ug/l	MW-26D_01/12/2000_N	1/11	0.9-1	1	ND	NV		NV		Y	NV
	VOCs															
	71-55-6	1,1,1-Trichloroethane	11	79	ug/l	S-11C_11/02/2000_N	9/31	1-1	79	ND	317.17	N	30	NJ GW	Y	AARAR
	79-34-5	1,1,2,2-Tetrachloroethane	3 J	140	ug/l	MW-23D_01/13/2000_N	14/31	1-10	140	ND	0.05	C	2	NJ GW	Y	ASL
	79-00-5	1,1,2-Trichloroethane	2 J	26	ug/l	MW-22D_01/10/2000_N	13/31	1-40	26	ND	0.19	C	3	NJ GW	Y	ASL
	75-34-3	1,1-Dichloroethane	3 J	85	ug/l	MW-26D_01/12/2000_N	27/31	1-2	85	ND	79.84	N	70	NJ GW	Y	ASL
	75-35-4	1,1-Dichloroethene	1 J	77	ug/l	S-11C_11/02/2000_N	20/31	1-1	77	ND	33.88	N	1	NJ GW	Y	ASL
	120-82-1	1,2,4-Trichlorobenzene	1 J	1 J	ug/l	MW-26D_01/12/2000_N	1/11	0.9-1	1	ND	0.72	N	9	NJ GW	Y	ASL
	95-50-1	1,2-Dichlorobenzene	1 J	76	ug/l	S-11C_01/14/2000_N	7/11	0.9-1	76	ND	26.82	N	600	NJ GW	Y	ASL
	107-06-2	1,2-Dichloroethane	2 J	470	ug/l	MW-23D_01/13/2000_N	28/31	1-2	470	ND	0.12	C	0.30	NJ GW	Y	ASL
	78-87-5	1,2-Dichloropropane	4 J	103	ug/l	MW-26D_11/03/2000_N	13/31	1-1	103	ND	0.16	C	0.50	NJ GW	Y	ASL
	541-73-1	1,3-Dichlorobenzene	1 NJ	1 NJ	ug/l	S-11C_01/14/2000_N	1/11	0.9-1	1	ND	0.55	N	600	NJ GW	Y	ASL
	106-46-7	1,4-Dichlorobenzene	1 J	6 J	ug/l	S-11C_01/14/2000_N	4/11	0.9-1	6	ND	0.47	C	75	NJ GW	Y	ASL
	78-93-3	2-Butanone	4 J	5100	ug/l	MW-23D_01/13/2000_N	12/31	3-4	5100	ND	190.43	N	300	NJ GW	Y	ASL
	591-78-6	2-Hexanone	18 J	74 J	ug/l	S-11C_11/02/2000_N	3/31	3-140	74	ND	146	N	NV		N	BSL
	67-64-1	Acetone	7 J	37500 D	ug/l	MW-23D_11/02/2000_N	15/31	6-16	37500	ND	60.83	N	700	NJ GW	Y	ASL
	71-43-2	Benzene	2 J	960	ug/l	MW-23D_01/13/2000_N	31/31	NA	960	ND	0.34	C	0.20	NJ GW	Y	ASL
	75-15-0	Carbon disulfide	11	2200	ug/l	MW-26D_01/12/2000_N	11/31	1-3	2200	ND	104.29	N	NV		Y	ASL
	108-90-7	Chlorobenzene	3 J	80	ug/l	MW-23D_01/13/2000_N	21/31	1-1	80	ND	10.61	N	4	NJ GW	Y	ASL

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Table 2-19
Selection of Chemicals of Potential Concern
AOC 3: Deep Groundwater
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Ground water
Exposure Medium:	Deep Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value (4)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	75-00-3	Chloroethane	5	20	ug/l	MW-26D_11/03/2000_N	5/31	2-60	20	ND	3.64	C	NV		Y	ASL
	67-66-3	Chloroform	1 J	70	ug/l	S-11C_11/02/2000_N	12/31	1-1	70	ND	0.15	C	6	NJ GW	Y	ASL
	74-87-3	Chloromethane	11 J	11 J	ug/l	MW-26D_11/03/2000_N	1/31	2-60	11	ND	1.51	C	30	NJ GW	N	FOD
	156-59-2	cis-1,2-Dichloroethene	2 J	1700	ug/l	MW-23D_01/13/2000_N	29/31	2-2	1700	ND	6.08	N	10	NJ GW	Y	ASL
	100-41-4	Ethylbenzene	2 J	440	ug/l	MW-23D_01/13/2000_N	18/31	1-2	440	ND	2.91	C	700	NJ GW	Y	ASL
	75-09-2	*Methylene chloride*	4 J	2400	ug/l	MW-23D_01/13/2000_N	13/31	2-2	2400	ND	4.10	C	2	NJ GW	Y	ASL
	100-42-5	Styrene	3 J	3 J	ug/l	MW-27D_01/10/2000_N	1/31	1-20	3	ND	162.35	N	100	NJ GW	N	FOD
	127-18-4	Tetrachloroethene	1 J	67	ug/l	S-11C_11/02/2000_N	22/31	1-1	67	ND	0.10	C	0.40	NJ GW	Y	ASL
	108-88-3	Toluene	1 J	2900	ug/l	MW-23D_01/13/2000_N	15/31	1-2	2900	ND	72.34	N	1000	NJ GW	Y	ASL
	156-60-5	trans-1,2-Dichloroethene	2 J	24 J	ug/l	MW-23D_01/13/2000_N	13/31	1-40	24	ND	12.17	N	100	NJ GW	Y	ASL
	79-01-6	Trichloroethene	1 J	5800 D	ug/l	S-11C_11/02/2000_N	27/31	1-1	5800	ND	0.03	C	1.00	NJ GW	Y	ASL
	75-01-4	Vinyl chloride	1 J	93	ug/l	MW-4D_01/07/2000_N	26/31	1-2	93	ND	0.02	C	0.08	NJ GW	Y	ASL
	1330-20-7	Xylenes (Total)	1 J	1400	ug/l	MW-23D_01/13/2000_N	18/31	1-1	1400	ND	21.0	N	40	NJ GW	Y	ASL

(1) The maximum detected concentration is used as the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are the lower of Region III RBCs and Region IX PRGs (Tap Water). HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) ARAR values are the lower of New Jersey Groundwater Criteria and USEPA MCLs.

(5) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated
FOD = Detection Frequency < 5%

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.
E = Estimated due to interference (inorganic qualifier).
D= Compound quantitated on a diluted sample.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800206

Table 2-20
Selection of Chemicals of Potential Concern
AOC 4: Deep Groundwater
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Ground water
Exposure Medium:	Deep Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
AOC 4	**Metals**															
	7429-90-5	Aluminum	93.4 J	148 J	ug/l	MW-19D_01/06/2000_N	2/6	3-77	148	220	3649.87	N	200	NJ GW	N	BSL
	7440-38-2	Arsenic	7.3 B	7.3 B	ug/l	MW-17D_01/04/2000_N	1/3	5-5	7.3	ND	0.04	C	0.02	NJ GW	Y	ASL
	7440-39-3	Barium	66.3 B	174	ug/l	MW-18D_01/06/2000_N	3/3	NA	174	42	255.50	N	2000	NJ GW	N	BSL
	7440-70-2	Calcium	13400 J	37300 J	ug/l	MW-17D_01/04/2000_N	3/3	NA	37300	7,830	NV		NV		N	NUT
	7440-48-4	Cobalt	9.9 B	35 B	ug/l	MW-17D_01/04/2000_N	3/3	NA	35	ND	73.00	N	NV		N	BSL
	7439-89-6	Iron	11100	94700	ug/l	MW-17D_01/04/2000_N	7/7	NA	94700	1,800	1094.99	N	300	NJ GW	N	NUT
	7439-95-4	Magnesium	4180	19100	ug/l	MW-18D_01/06/2000_N	3/3	NA	19100	4,640	NV		NV		N	NUT
	7439-96-5	Manganese	193	754	ug/l	MW-18D_06/11/2001_T	7/7	NA	754	121	73	N	50	NJ GW	N	NUT
	7440-02-0	Nickel	15 B	56.1	ug/l	MW-17D_01/04/2000_N	3/3	NA	56.1	ND	73.00	N	100	NJ GW	N	BSL
	7440-09-7	Potassium	3620 *	7030 *	ug/l	MW-17D_01/04/2000_N	3/3	NA	7030	7,860	NV		NV		N	NUT
	7440-23-5	Sodium	4990	7460	ug/l	MW-18D_01/06/2000_N	2/2	NA	7460	NA	NV		50000	NJ GW	N	NUT
	7440-62-2	Vanadium	5.8 B	15.8 B	ug/l	MW-17D_01/04/2000_N	3/3	NA	15.8	ND	25.55	N	NV		N	BSL
	7440-66-6	Zinc	79.4	175	ug/l	MW-19D_01/06/2000_N	2/2	NA	175	NA	1094.99	N	5000	NJ GW	N	BSL
	SVOCs															
	111-44-4	bis(2-Chloroethyl)ether	1 J	480 D	ug/l	MW-17D_01/04/2000_N	3/3	NA	480	ND	0.01	C	0.03	NJ GW	Y	ASL
	84-66-2	Diethyl phthalate	2 J	2 J	ug/l	MW-17D_01/04/2000_N	1/3	2-2	2	ND	2919.91	N	5000	NJ GW	N	BSL
	78-59-1	Isophorone	5 J	5 J	ug/l	MW-17D_01/04/2000_N	1/3	1-1	5	ND	70.50	C	100	NJ GW	N	BSL
	VOCs															
	79-34-5	1,1,2,2-Tetrachloroethane	2 J	10	ug/l	MW-18D_01/06/2000_N	4/9	1-2	10	ND	0.05	C	2	NJ GW	Y	ASL
	79-00-5	1,1,2-Trichloroethane	2 J	3 J	ug/l	MW-18D_06/11/2001_N	3/9	1-2	3	ND	0.19	C	3	NJ GW	Y	ASL
	75-34-3	1,1-Dichloroethane	1 J	8	ug/l	MW-17D_01/04/2000_N	5/9	1-2	8	ND	79.84	N	70	NJ GW	N	BSL
	75-35-4	1,1-Dichloroethene	1 J	2 J	ug/l	MW-17D_10/30/2000_N	3/9	1-31.9	2	ND	33.88	N	1	NJ GW	Y	AARAR
	107-06-2	1,2-Dichloroethane	6	32	ug/l	MW-17D_10/30/2000_N	6/9	1-2	32	ND	0.12	C	0.3	NJ GW	Y	ASL

800207

Table 2-20
Selection of Chemicals of Potential Concern
AOC 4: Deep Groundwater
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current/Future
Medium:	Ground water
Exposure Medium:	Deep Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	67-64-1	Acetone	10 J	10 J	ug/l	MW-17D_01/04/2000_N	1/9	6-31.9	10	ND	60.83	N	700	NJ GW	N	BSL
	71-43-2	Benzene	1 J	43	ug/l	MW-17D_01/04/2000_N	7/9	1-1	43	ND	0.34	C	0.2	NJ GW	Y	ASL
	75-15-0	Carbon disulfide	4 J	5	ug/l	MW-17D_05/02/2001_N	3/9	1-3	5	ND	104.29	N	NV		N	BSL
	108-90-7	Chlorobenzene	1 J	1 J	ug/l	MW-17D_01/04/2000_N	1/9	1-37.6	1	ND	10.61	N	4	NJ GW	N	BSL
	67-66-3	Chloroform	13	15	ug/l	MW-17D_01/04/2000_N	3/9	1-6	15	ND	0.15	C	6	NJ GW	Y	ASL
	156-59-2	cis-1,2-Dichloroethene	6	56	ug/l	MW-17D_05/02/2001_N	6/9	1-2	56	ND	6.08	N	10	NJ GW	Y	ASL
	127-18-4	Tetrachloroethene	1 J	1 J	ug/l	MW-17D_05/02/2001_N	3/9	1-1	1	ND	0.10	C	0.4	NJ GW	Y	ASL
	156-60-5	trans-1,2-Dichloroethene	1 J	1 J	ug/l	MW-18D_06/11/2001_N	2/9	1-2	1	ND	12.17	N	100	NJ GW	N	BSL
	79-01-6	Trichloroethene	18	54	ug/l	MW-17D_05/02/2001_N	6/9	1-1	54	ND	0.03	C	1	NJ GW	Y	ASL
	75-01-4	Vinyl chloride	15	18	ug/l	MW-17D_05/02/2001_N	3/9	1-2	18	ND	0.015	C	0.08	NJ GW	Y	ASL
	1330-20-7	Xylenes (Total)	2 J	2 J	ug/l	MW-17D_05/02/2001_N	3/9	1-3	2	ND	21.00	N	40	NJ GW	N	BSL

(1) The maximum detected concentration is used as the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are the lower of Region III RBCs and Region IX PRGs (Tap Water). HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) ARAR values are the lower of New Jersey Groundwater Criteria and USEPA MCLs.

(5) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: CO
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated
FOD = Detection Frequency < 5%

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.
D= Compound quantitated on a diluted sample.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

Table 2-21
Selection of Chemicals of Potential Concern
Cedar Swamp: Sediment
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
Cedar Swamp	**Metals**																
(Culvert -Tide Gate)	7440-43-9	Cadmium	1 B	2 B	mg/kg	CS-401_12/07/2000_0_0.5	2/4	0.33-1	2	2	3.91	N	3.70	N	Reg IX PRG (res)	N	BSL
	7440-47-3	Chromium	14	67	mg/kg	CS-401_12/07/2000_0_0.5	4/4	NA	67	66.5	2.35	N	210.68	C	Reg IX PRG (res)	Y	ASL
	7440-48-4	Cobalt	2 B	6 B	mg/kg	CS-6_12/11/2000_0_0.5	4/4	NA	6	19	156.43	N	902.89	C	Reg IX PRG (res)	N	BSL
	7440-50-8	Copper	5 B	46	mg/kg	CS-401_12/07/2000_0_0.5	4/4	NA	46	54	312.86	N	312.86	N	Reg IX PRG (res)	N	BSL
	7439-92-1	Lead	3	237	mg/kg	CS-401_12/07/2000_0_0.5	11/11	NA	237	113	NV		40	N	Reg IX PRG (res)	Y	AARAR
	7439-97-6	Mercury	0.076 B	0.64 B	mg/kg	CS-401_12/07/2000_0_0.5	4/4	NA	0.64	0.335	0.08	N	0.06	N	Reg IX PRG (res)	Y	ASL
	7440-02-0	Nickel	5 B	27 B	mg/kg	CS-401_12/07/2000_0_0.5	4/4	NA	27	43	156.43	N	156.43	N	Reg IX PRG (res)	N	BSL
	7440-62-2	Vanadium	23	74	mg/kg	CS-401_12/07/2000_0_0.5	4/4	NA	74	64	54.75	N	54.75	N	Reg IX PRG (res)	Y	ASL
	7440-66-6	Zinc	25	215	mg/kg	CS-401_12/07/2000_0_0.5	4/4	NA	215	342	2346.43	N	2346.32	N	Reg IX PRG (res)	N	BSL
	PCBs																
	1336-36-3	Total PCBs	0.028	3.9	mg/kg	LTC-54_12/11/2000_0_0.5	7/9	0.01-0.011	3.9	0.31	0.32	C	0.22	C	Reg IX PRG (res)	Y	ASL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Residential Region III Soil RBCs. HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800209

Table 2-22
Selection of Chemicals of Potential Concern
Little Timber Creek Swamp: Sediment
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)		Potential ARAR/TBC Value		Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	Metals																
Little Timber Creek Swamp	7440-43-9	Cadmium	0.61 B	2 B	mg/kg	LTC-204_12/07/2000_0_0.5	5/7	0.38-1	2	2	3.91	N	3.70	N	Reg IX PRG (res)	N	BSL
	7440-47-3	Chromium	8	104	mg/kg	LTC-59_12/06/2000_0_0.5	7/7	NA	104	66.5	2.35	N	210.68	C	Reg IX PRG (res)	Y	ASL
LTCS H3: (R130-R44)	7440-48-4	Cobalt	2 B	7 B	mg/kg	LTC-59_12/06/2000_0_0.5	7/7	NA	7	19	156.43	N	902.89	C	Reg IX PRG (res)	N	BSL
	7440-50-8	Copper	4	71	mg/kg	LTC-59_12/06/2000_0_0.5	7/7	NA	71	54	312.86	N	312.86	N	Reg IX PRG (res)	N	BSL
	7439-92-1	Lead	8	416	mg/kg	LTC-59_12/06/2000_0_0.5	7/7	NA	416	113	NV		40	N	Reg IX PRG (res)	Y	AARAR
	7439-97-6	Mercury	0.007 B	1 B	mg/kg	LTC-59_12/06/2000_0_0.5	7/7	NA	1	0.335	0.08	N	0.06	N	Reg IX PRG (res)	Y	ASL
	7440-02-0	Nickel	11	37 B	mg/kg	LTC-59_12/06/2000_0_0.5	7/7	NA	37	43	156.43	N	156.43	N	Reg IX PRG (res)	N	BSL
	7440-62-2	Vanadium	11	82	mg/kg	LTC-59_12/06/2000_0_0.5	7/7	NA	82	64	54.75	N	54.75	N	Reg IX PRG (res)	Y	ASL
	7440-66-6	Zinc	36	332	mg/kg	LTC-59_12/06/2000_0_0.5	7/7	NA	332	342	2346.43	N	2346.32	N	Reg IX PRG (res)	N	BSL
	PCBs																
	1336-36-3	Total PCBs	0.097 P	5.7 P	mg/kg	LTC-322_12/11/2000_0_0.5	6/7	0.007-0.007	5.7	0.3085	0.32	C	0.22	C	Reg IX PRG (res)	Y	ASL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are Residential Region III Soil RBCs. HQ for NC compounds conservatively adjusted to 0.1.
Total Chromium (1:6 Cr VI: Cr III) is used in Region IX numbers; Cr VI is used in Region III numbers for this table.
Methyl mercury is used by both Region IX and Region III for this table.
The Region IX CAL-Modified PRG is used for lead; The cancer endpoint is used for the Region IX Arsenic number.

(4) Rationale Codes:
BSL = Below Screening Level
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR =Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columns >25%.
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

800210

Table 2-23
Selection of Chemicals of Potential Concern
Cedar Swamp: Surface Water
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current
Medium:	Surface Water
Exposure Medium:	Surface Water

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)	Potential ARAR/TBC Value (4)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Cedar Swamp	**Metals**														
(Culvert -Tide Gate)	7429-90-5	Aluminum	93.5	145 B	ug/l	LTC-58/SW	2/2	NA	145	698	NV	NV		Y	NV
	7440-39-3	Barium	50.15 B	52 B	ug/l	LTC-58/SW	2/2	NA	52	34.9	1000	2000	NJ SW	N	BSL
	7440-70-2	Calcium	8690	9660 P	ug/l	CS-200/SW	2/2	NA	9660	17650	NV	NV		N	NUT
	7439-89-6	Iron	1440 N*	3190	ug/l	LTC-58/SW	2/2	NA	3190	1270	NV	NV		N	NUT
	7439-95-4	Magnesium	4560	4725 P	ug/l	CS-200/SW	2/2	NA	4725	6980	NV	NV		N	NUT
	7439-96-5	Manganese	55.8 *	98.2	ug/l	LTC-58/SW	2/2	NA	98.2	99.5	NV	100	NJ SW	N	NUT
	7440-09-7	Potassium	3770	3775 P	ug/l	CS-200/SW	2/2	NA	3775	2990	NV	NV		N	NUT
	7440-23-5	Sodium	8465	14800	ug/l	LTC-58/SW	2/2	NA	14800	19900	NV	NV		N	NUT
	7440-66-6	Zinc	6.7 B	13.8 B	ug/l	CS-200/SW	2/2	NA	13.8	23.8	7400	NV		N	BSL
	SVOCs														
	108-10-1	4-Methyl-2-Pentanone	95	95	ug/l	CS-200/SW	1/2	5-5	95	ND	NV	NV		Y	NV
	85-01-8	Phenanthrene	1 J	1 J	ug/l	LTC-58/SW	1/2	1-1	1	ND	NV	NV		Y	NV
	VOCs														
	71-55-6	1,1,1-Trichloroethane	27	27	ug/l	CS-200/SW	1/2	1-1	27	ND	NV	127	NJ SW	N	BSL
	79-34-5	1,1,2,2-Tetrachloroethane	18	18	ug/l	CS-200/SW	1/2	2-2	18	ND	0.17	NV		Y	ASL
	79-00-5	1,1,2-Trichloroethane	22	22	ug/l	CS-200/SW	1/2	2-2	22	ND	0.59	13.5	NJ SW	Y	ASL
	75-34-3	1,1-Dichloroethane	26	26	ug/l	CS-200/SW	1/2	2-2	26	ND	NV	NV		Y	NV
	75-35-4	1,1-Dichloroethene	26	26	ug/l	CS-200/SW	1/2	1-1	26	ND	330	4.81	NJ SW	Y	AARAR
	107-06-2	1,2-Dichloroethane	26	26	ug/l	CS-200/SW	1/2	2-2	26	ND	0.38	0.291	NJ SW	Y	ASL
	78-87-5	1,2-Dichloropropane	20	20	ug/l	CS-200/SW	1/2	1-1	20	ND	0.5	NV		Y	ASL
	78-93-3	2-Butanone	130	130	ug/l	CS-200/SW	1/2	3-3	130	ND	NV	NV		Y	NV
	591-78-6	2-Hexanone	94	94	ug/l	CS-200/SW	1/2	7-7	94	ND	NV	NV		Y	NV
	67-64-1	Acetone	150	150	ug/l	CS-200/SW	1/2	6-6	150	ND	NV	NV		Y	NV
	71-43-2	Benzene	22	22	ug/l	CS-200/SW	1/2	1-1	22	ND	2.2	0.15	NJ SW	Y	ASL
	75-27-4	Bromodichloromethane	24	24	ug/l	CS-200/SW	1/2	1-1	24	ND	0.55	0.266	NJ SW	Y	ASL
	75-25-2	Bromoform	23	23	ug/l	CS-200/SW	1/2	1-1	23	ND	4.3	4.38	NJ SW	Y	ASL
	74-83-9	Bromomethane	19	19	ug/l	CS-200/SW	1/2	3-3	19	ND	47	NV		N	BSL
	75-15-0	Carbon Disulfide	27	27	ug/l	CS-200/SW	1/2	3-3	27	ND	NV	NV		Y	NV
	56-23-5	Carbon Tetrachloride	29	29	ug/l	CS-200/SW	1/2	1-1	29	ND	0.23	0.363	NJ SW	Y	ASL

800211

Table 2-23
Selection of Chemicals of Potential Concern
Cedar Swamp: Surface Water
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current
Medium:	Surface Water
Exposure Medium:	Surface Water

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)	Potential ARAR/TBC Value (4)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	108-90-7	Chlorobenzene	23	23	ug/l	CS-200/SW	1/2	1-1	23	ND	130	22	NJ SW	Y	AARAR
	75-00-3	Chloroethane	17	17	ug/l	CS-200/SW	1/2	3-3	17	ND	NV	NV		Y	NV
	67-66-3	Chloroform	24	24	ug/l	CS-200/SW	1/2	1-1	24	ND	5.7	5.67	NJ SW	Y	ASL
	74-87-3	Chloromethane	17	17	ug/l	CS-200/SW	1/2	3-3	17	ND	NV	NV		Y	NV
	156-59-2	cis-1,2-Dichloroethene	26	26	ug/l	CS-200/SW	1/2	2-2	26	ND	NV	NV		Y	NV
	10061-01-5	cis-1,3-Dichloropropene	21	21	ug/l	CS-200/SW	1/2	1-1	21	ND	NV	NV		Y	NV
	124-48-1	Dibromochloromethane	24	24	ug/l	CS-200/SW	1/2	2-2	24	ND	0.4	0.266	NJ SW	Y	ASL
	100-41-4	Ethylbenzene	23	23	ug/l	CS-200/SW	1/2	2-2	23	ND	530	3030	NJ SW	N	BSL
	75-09-2	Methylene Chloride	25	25	ug/l	CS-200/SW	1/2	2-2	25	ND	4.6	NV		Y	ASL
	100-42-5	Styrene	23	23	ug/l	CS-200/SW	1/2	1-1	23	ND	NV	NV		Y	NV
	127-18-4	Tetrachloroethene	25	25	ug/l	CS-200/SW	1/2	1-1	25	ND	0.69	0.388	NJ SW	Y	ASL
	108-88-3	Toluene	22	22	ug/l	CS-200/SW	1/2	2-2	22	ND	1300	7440	NJ SW	N	BSL
	156-60-5	trans-1,2-Dichloroethene	25	25	ug/l	CS-200/SW	1/2	2-2	25	ND	140	592	NJ SW	N	BSL
	10061-02-6	trans-1,3-Dichloropropene	21	21	ug/l	CS-200/SW	1/2	1-1	21	ND	NV	NV		Y	NV
	79-01-6	Trichloroethene	23	23	ug/l	CS-200/SW	1/2	1-1	23	ND	2.5	1.09	NJ SW	Y	ASL
	75-01-4	Vinyl Chloride	18	18	ug/l	CS-200/SW	1/2	2-2	18	ND	0.025	0.083	NJ SW	Y	ASL
	1330-20-7	Xylenes (Total)	69	69	ug/l	CS-200/SW	1/2	1-1	69	ND	NV	NV		Y	NV
	PCBs														
	1336-36-3	Total PCBs	0.034 J	0.034 JP	ug/l	CS-200/SW	1/2	0.019-0.019	0.034	ND	0.000064	0.014	NJ SW	Y	ASL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are from Ambient Water Quality Criteria 2002.

(4) ARAR Values from New Jersey Surface Water Criteria.

(5) Rationale Codes:

BSL = Below Screening Level
NV = No toxicity value available: COPC
AARAR- Above Applicable or Relevant and Appropriate Requirements
NUT = Essential nutrient, not quantitatively evaluated
ASL = Above Screening Level

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation column
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

Table 2-24
Selection of Chemicals of Potential Concern
Little Timber Creek Swamp: Surface Water
BROS Human Health Risk Assessment
Bridgeport, NJ

Scenario Timeframe:	Current
Medium:	Surface Water
Exposure Medium:	Surface Water

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (N/C) (3)	Potential ARAR/TBC Value (4)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Little Timber Creek Swamp	**Metals**														
(R130-R44)	7429-90-5	Aluminum	80.6 B	145 B	ug/l	LTC-58/SW	2/3	77-77	145	698	NV	NV		Y	NV
	7440-39-3	Barium	50.7 B	53.1 B	ug/l	LTC-58/SW	3/3	NA	53.1	34.9	1000	2000	NJ SW	N	BSL
	7440-70-2	Calcium	8690	10200 P	ug/l	LTC-201/SW	3/3	NA	10200	17650	NV	NV		N	NUT
	7439-89-6	Iron	970 N*	3190	ug/l	LTC-58/SW	3/3	NA	3190	1270	NV	NV		N	NUT
	7439-95-4	Magnesium	4560	4990 P	ug/l	LTC-201/SW	3/3	NA	4990	6980	NV	NV		N	NUT
	7439-96-5	Manganese	63.9 *	98.2	ug/l	LTC-58/SW	3/3	NA	98.2	99.5	NV	100	NJ SW	N	NUT
	09/07/7440	Potassium	3700 P	4000 P	ug/l	LTC-200/SW	3/3	NA	4000	2990	NV	NV		N	NUT
	7440-23-5	Sodium	8100 P	14800	ug/l	LTC-58/SW	3/3	NA	14800	19900	NV	NV		N	NUT
	7440-66-6	Zinc	6.7 B	9.4 B	ug/l	LTC-200/SW	3/3	NA	9.4	23.8	7400	NV		N	BSL
	SVOCs										NV	NV			
	85-01-8	Phenanthrene	1 J	1 J	ug/l	LTC-58/SW	1/3	1-1	1	ND	NV	NV		Y	NV
	PCBs										NV	NV			
	1336-36-3	Total PCBs	0.054 J	0.084	ug/l	LTC-200/SW	2/3	0.019-0.019	0.084	ND	0.000064	0.014	NJ SW	Y	ASL

(1) The maximum detected concentration is the "Concentration Used for Screening".

(2) Background Value obtained from site investigation. Concentration is maximum detected value.

(3) Screening Toxicity Values are from Ambient Water Quality Criteria 2002.

(4) ARAR Values from New Jersey Surface Water Criteria.

(5) Rationale Codes:

BSL = Below Screening Level
NUT = Essential nutrient, not quantitatively evaluated
NV = No toxicity value available: COPC
ASL = Above Screening Level
AARAR- Above Applicable or Relevant and Appropriate Requirements

Definitions: NA: Not Applicable

Qualifiers: N = (Inorganic) Spike Sample not within Control Limits
* = Duplicate analysis not within control limits.
P = Concentration difference between primary and confirmation columr
J = Estimated Value.
B = (Inorganic) Value is <CRDL, but > = IDL.

Toxicity Values: N - Noncarcinogenic; C - carcinogenic
max = Ceiling limit
sat = Soil saturation

Table 2-25
Summary of Chemicals of Potential Concern
Soil
BROS Human Health Risk Assessment
Bridgeport, NJ

Analyte		AOC 1				AOC 2				AOC 3				AOC 4			
Depth Interval:		Surface		Subsurface		Surface		Subsurface		Surface		Subsurface		Surface		Subsurface	
Exposure Type:		Res	Ind	Res	Ind	Res	Ind	Res	Ind	Res	Ind	Res	Ind	Res	Ind	Res	Ind
Metals																	
7429-90-5	Aluminum	Y	Y	NA	Y			NA		ND	ND	NA		ND	ND	NA	
7440-38-2	Arsenic	Y	Y	NA	Y	Y	Y	NA	Y	ND	ND	NA	Y	ND	ND	NA	Y
7440-47-3	Chromium	Y	Y	NA	Y	Y		NA		ND	ND	NA		ND	ND	NA	
7439-89-6	Iron	Y	Y	NA	Y	Y	Y	NA	Y	ND	ND	NA		ND	ND	NA	
7439-92-1	Lead			NA	Y	Y		NA	Y	ND	ND	NA		ND	ND	NA	
7439-96-5	Manganese	Y		NA		Y		NA		ND	ND	NA		ND	ND	NA	
7439-97-6	Mercury	Y		NA		Y		NA		ND	ND	NA		ND	ND	NA	
7440-28-0	Thallium	Y		NA				NA		ND	ND	NA		ND	ND	NA	
7440-62-2	Vanadium			NA				NA		ND	ND	NA		ND	ND	NA	
SVOCs																	
208-96-8	Acenaphthylene			NA	Y-nv			NA	Y-nv	ND	ND	NA		ND	ND	NA	
50-32-8	Benzo(a)pyrene			NA		Y	Y	NA	Y	ND	ND	NA		ND	ND	NA	
191-24-2	Benzo(g,h,i)perylene	Y-nv	Y-nv	NA	Y-nv	Y-nv	Y-nv	NA	Y-nv	ND	ND	NA	Y-nv	ND	ND	NA	
53-70-3	Dibenzo(a,h)anthracene			NA		Y		NA		ND	ND	NA		ND	ND	NA	
91-20-3	Naphthalene			NA	Y			NA		ND	ND	NA		ND	ND	NA	
85-01-8	Phenanthrene	Y-nv	Y-nv	NA	Y-nv	Y-nv	Y-nv	NA	Y-nv	ND	ND	NA	Y-nv	ND	ND	NA	
VOCs																	
100-41-4	Ethylbenzene			NA				NA		ND	ND	NA		ND	ND	NA	
1330-20-7	Xylenes (Total)			NA				NA		ND	ND	NA		ND	ND	NA	
PCBs																	
1336-36-3	Total PCBs			NA	Y	Y		NA	Y	ND	ND	NA		ND	ND	NA	

Notes:
Depth Intervals:
-Surface Soils (Bottom Depth of 0 - 0.5 ft)
-Subsurface Soils (Bottom Depth is average Depth to Water: 0 - 6 ft)
* AOC 6 and Pepper and Vicinity subsurface soils taken from 0 - 7 ft for data robustness. See text.
Y : COPC for specific AOC, Depth Interval and Exposure Type (Max Detect exceeds Screening Level)
Y-nv : COPC due to lack of screening criteria
NA : Exposure Type not applicable to specific AOC and/or Depth Interval.
ND : No data exists for specific AOC and/or Depth Interval

800214

Table 2-25
Summary of Chemicals of Potential Concern
Soil
BROS Human Health Risk Assessment
Bridgeport, NJ

Analyte		AOC 5				AOC 6				AOC BP			
Depth Interval:		Surface		Subsurface		Surface		Subsurface		Surface		Subsurface	
Exposure Type:		Res	Ind	Res	Ind	Res	Ind	Res	Ind	Res	Ind	Res	Ind
Metals													
7429-90-5	Aluminum	ND	ND	NA		ND	ND	NA		Y	Y	NA	Y
7440-38-2	Arsenic	ND	ND	NA	Y	ND	ND	NA		Y	Y	NA	Y
7440-47-3	Chromium	ND	ND	NA		ND	ND	NA		Y	Y	NA	Y
7439-89-6	Iron	ND	ND	NA		ND	ND	NA		Y	Y	NA	Y
7439-92-1	Lead	ND	ND	NA		ND	ND	NA		Y		NA	Y
7439-96-5	Manganese	ND	ND	NA		ND	ND	NA		Y		NA	
7439-97-6	Mercury	ND	ND	NA		ND	ND	NA		Y		NA	
7440-28-0	Thallium	ND	ND	NA		ND	ND	NA		Y		NA	
7440-62-2	Vanadium	ND	ND	NA		ND	ND	NA		Y		NA	
SVOCs													
208-96-8	Acenaphthylene	ND	ND	NA		ND	ND	NA				NA	Y-nv
50-32-8	Benzo(a)pyrene	ND	ND	NA		ND	ND	NA	Y	Y		NA	Y
191-24-2	Benzo(g,h,i)perylene	ND	ND	NA		ND	ND	NA	Y-nv	Y-nv	Y-nv	NA	Y-nv
53-70-3	Dibenzo(a,h)anthracene	ND	ND	NA		ND	ND	NA				NA	
91-20-3	Naphthalene	ND	ND	NA		ND	ND	NA				NA	
85-01-8	Phenanthrene	ND	ND	NA		ND	ND	NA	Y-nv	Y-nv	Y-nv	NA	Y-nv
VOCs													
100-41-4	Ethylbenzene	ND	ND	NA		ND	ND	NA	Y			NA	
1330-20-7	Xylenes (Total)	ND	ND	NA		ND	ND	NA	Y			NA	
PCBs													
1336-36-3	Total PCBs	ND	ND	NA		ND	ND	NA	Y	Y		NA	Y

Notes:
Depth Intervals:
-Surface Soils (Bottom Depth of 0 - 0.5 ft)
-Subsurface Soils (Bottom Depth is average Depth to Water: 0 - 6 ft)
* AOC 6 and Pepper and Vicinity subsurface soils taken from 0 - 7 ft for data robustness. See text.
Y : COPC for specific AOC, Depth Interval and Exposure Type (Max Detect exceeds Screening Level)
Y-nv : COPC due to lack of screening criteria
NA : Exposure Type not applicable to specific AOC and/or Depth Interval.
ND : No data exists for specific AOC and/or Depth Interval

Table 2-26
Summary of Chemicals of Potential Concern
Ground water
BROS Human Health Risk Assessment
Bridgeport, NJ

Analyte		AOC 1a	AOC 1b	AOC 1c	AOC 3	AOC 4
Metals						
7429-90-5	Aluminum	Y	Y		Y	
7440-38-2	Arsenic	Y		Y	Y	Y
7440-39-3	Barium	Y				
7440-41-7	Beryllium	Y			Y	
7440-47-3	Chromium	Y			Y	
7440-48-4	Cobalt	Y			Y	
7440-50-8	Copper	Y				
7439-92-1	Lead	Y			Y	
7439-97-6	Mercury	Y				
7440-02-0	Nickel	Y			Y	
7782-49-2	Selenium	Y			Y	
7440-28-0	Thallium	Y	Y		Y	
7440-62-2	Vanadium	Y			Y	
7440-66-6	Zinc	Y			Y	
SVOCs						
105-67-9	2,4-Dimehtylphenol	Y				
91-57-6	2-Methylnapthalene	Y				
99-09-2	3-Nitroaniline	Y-nv				
59-50-7	4-Chloro-3-methylphenol	Y-nv				
106-47-8	4-Chloroaniline	Y			Y	
108-10-1	4-Methyl-2-pentanone	Y			Y	
208-96-8	Acenaphthylene	Y-nv				
56-55-3	Benzo(a)anthracene	Y				
50-32-8	Benzo(a)pyrene	Y				
205-99-2	Benzo(b)fluoranthene	Y				
191-24-2	Benzo(g,h,i)perylene	Y-nv				
111-44-4	bis(2-Chloroethyl)ether	Y			Y	Y
117-81-7	bis(2-Ethylhexyl)phthalate	Y				
132-64-9	Dibenzofuran	Y				
193-39-5	Indeno(1,2,3-cd)pyrene	Y				
78-59-1	Isophorone	Y			Y	
91-20-3	Naphthalene	Y			Y	
98-95-3	Nitrobenzene				Y	
85-01-8	Phenanthrene	Y-nv			Y-nv	
VOCs						
71-55-6	1,1,1-Trichloroethane	Y			Y	
79-34-5	1,1,2,2-Tetrachloroethane				Y	Y
79-00-5	1,1,2-Trichloroethane				Y	Y

Table 2-26
Summary of Chemicals of Potential Concern
Ground water
BROS Human Health Risk Assessment
Bridgeport, NJ

Analyte		AOC 1a	AOC 1b	AOC 1c	AOC 3	AOC 4
75-34-3	1,1-Dichloroethane	Y			Y	
75-35-4	1,1-Dichloroethene				Y	Y
120-82-1	1,2,4-Trichlorobenzene	Y			Y	
95-50-1	1,2-Dichlorobenzene				Y	
107-06-2	1,2-Dichloroethane	Y			Y	Y
78-87-5	1,2-Dichloropropane	Y			Y	
541-73-1	1,3-Dichlorobenzene	Y			Y	
106-46-7	1,4-Dichlorobenzene	Y			Y	
78-93-3	2-Butanone	Y			Y	
67-64-1	Acetone	Y			Y	
71-43-2	Benzene	Y			Y	Y
75-15-0	Carbon disulfide	Y			Y	
108-90-7	Chlorobenzene	Y			Y	
75-00-3	Chloroethane	Y			Y	
67-66-3	Chloroform	Y			Y	Y
156-59-2	cis-1,2-Dichloroethene	Y			Y	Y
100-41-4	Ethylbenzene	Y			Y	
75-09-2	Methylene chloride	Y			Y	
127-18-4	Tetrachloroethene	Y			Y	Y
108-88-3	Toluene	Y			Y	
156-60-5	trans-1,2-Dichloroethene	Y			Y	
79-01-6	Trichloroethene	Y			Y	Y
75-01-4	Vinyl chloride	Y			Y	Y
1330-20-7	Xylenes (Total)	Y			Y	
PCBs						
1336-36-3	Total PCBs	Y				

Notes:
Y : COPC for specific AOC (Max Detect exceeds Screening Level and/or ARAR)
Y-nv : COPC due to lack of screening criteria

800217

Table 2-27
Summary of Chemicals of Potential Concern
Sediment
BROS Human Health Risk Assessment
Bridgeport, NJ

Analyte		LTCS-H3 (R130-R44)	CS-H1B (From Culvert to Tide Gate)
Metals			
7440-47-3	Chromium	Y	Y
7439-92-1	Lead	Y	Y
7439-97-6	Mercury	Y	Y
7440-62-2	Vanadium	Y	Y
PCBs			
1336-36-3	Total PCBs	Y	Y

Notes:
Y : COPC for specific AOC, Depth Interval and Exposure Type (Max Detect exceeds Screening Level)
Y-nv : COPC due to lack of screening criteria

800218

Table 2-28
Summary of Chemicals of Potential Concern
Surface Water
BROS Human Health Risk Assessment
Bridgeport, NJ

Analyte		LTCS-H3 (R130-R44)	CS-H1B (From Culvert to Tide Gate)
Metals			
7429-90-5	Aluminum	Y-nv	Y-nv
PCBs			
1336-36-3	Total PCBs	Y	Y
SVOCs			
108-10-1	4-Methyl-2-pentanone		Y-nv
85-01-8	Phenanthrene	Y-nv	Y-nv
VOCs			
79-34-5	1,1,2,2-Tetrachloroethane		Y
79-00-5	1,1,2-Trichloroethane		Y
75-34-3	1,1-Dichloroethane		Y-nv
75-35-4	1,1-Dichloroethene		Y
107-06-2	1,2-Dichloroethane		Y
78-87-5	1,2-Dichloropropane		Y
78-93-3	2-Butanone		Y-nv
591-78-6	2-Hexanone		Y-nv
67-64-1	Acetone		Y-nv
71-43-2	Benzene		Y
75-27-4	Bromodichloromethane		Y
75-25-2	Bromoform		Y
75-15-0	Carbon disulfide		Y-nv
56-23-5	Carbon Tetrachloride		Y
108-90-7	Chlorobenzene		Y
75-00-3	Chloroethane		Y-nv
67-66-3	Chloroform		Y
74-87-3	Chloromethane		Y-nv
156-59-2	cis-1,2-Dichloroethene		Y-nv
10061-01-5	cis-1,3-Dichloropropene		Y-nv
124-48-1	Dibromochloromethane		Y
10061-02-6	trans-1,3-Dichloropropene		Y-nv
75-09-2	Methylene chloride		Y
100-42-5	Styrene		Y-nv
127-18-4	Tetrachloroethene		Y
79-01-6	Trichloroethene		Y
75-01-4	Vinyl chloride		Y
1330-20-7	Xylenes (Total)		Y-nv

Notes:
Y : COPC for specific AOC (Max Detect exceeds Screening Level)
Y-nv : COPC due to lack of screening criteria

Table 2-29
Summary of Chemicals of Potential Concern
Summary
BROS Human Health Risk Assessment
Bridgeport, NJ

Analyte		Surface Water	Sediment	Groundwater	Soil
Metals					
7429-90-5	Aluminum	Y-nv		Y	Y
7440-38-2	Arsenic			Y	Y
7440-39-3	Barium			Y	
7440-41-7	Beryllium			Y	
7440-47-3	Chromium		Y	Y	Y
7440-48-4	Cobalt			Y	
7440-50-8	Copper			Y	
7439-89-6	Iron				Y
7439-92-1	Lead		Y	Y	Y
7439-96-5	Manganese				Y
7439-97-6	Mercury		Y	Y	Y
7440-02-0	Nickel			Y	
7782-49-2	Selenium			Y	
7440-28-0	Thallium			Y	Y
7440-62-2	Vanadium		Y	Y	Y
7440-66-6	Zinc			Y	
PCBs					
1336-36-3	Total PCBs	Y	Y	Y	Y
SVOCs					
105-67-9	2,4-Dimethylphenol			Y	
91-57-6	2-Methylnapthalene			Y	
99-09-2	3-Nitroaniline			Y-nv	
59-50-7	4-Chloro-3-methylphenol			Y-nv	
106-47-8	4-Chloroaniline			Y	
108-10-1	4-Methyl-2-pentanone	Y		Y	
208-96-8	Acenaphthylene			Y-nv	Y-nv
56-55-3	Benzo(a)anthracene			Y	
50-32-8	Benzo(a)pyrene			Y	Y
205-99-2	Benzo(b)fluoranthene			Y	
191-24-2	Benzo(g,h,i)perylene			Y-nv	Y-nv
111-44-4	bis(2-Chloroethyl)ether			Y	
117-81-7	bis(2-Ethylhexyl)phthalate			Y	
53-70-3	Dibenzo(a,h)anthracene				Y
132-64-9	Dibenzofuran			Y	
193-39-5	Indeno(1,2,3-cd)pyrene			Y	
78-59-1	Isophorone			Y	
91-20-3	Naphthalene			Y	Y
98-95-3	Nitrobenzene			Y	
85-01-8	Phenanthrene	Y-nv		Y-nv	Y-nv

Table 2-29
Summary of Chemicals of Potential Concern
Summary
BROS Human Health Risk Assessment
Bridgeport, NJ

Analyte		Surface Water	Sediment	Groundwater	Soil
VOCs					
71-55-6	1,1,1-Trichloroethane			Y	
79-34-5	1,1,2,2-Tetrachloroethane	Y		Y	
79-00-5	1,1,2-Trichloroethane	Y		Y	
75-34-3	1,1-Dichloroethane	Y		Y	
75-35-4	1,1-Dichloroethene	Y		Y	
120-82-1	1,2,4-Trichlorobenzene			Y	
95-50-1	1,2-Dichlorobenzene			Y	
107-06-2	1,2-Dichloroethane	Y		Y	
78-87-5	1,2-Dichloropropane	Y		Y	
541-73-1	1,3-Dichlorobenzene			Y	
106-46-7	1,4-Dichlorobenzene			Y	
78-93-3	2-Butanone	Y		Y	
591-78-6	2-Hexanone	Y			
67-64-1	Acetone	Y		Y	
71-43-2	Benzene	Y		Y	
75-27-4	Bromodichloromethane	Y			
75-25-2	Bromoform	Y			
75-15-0	Carbon disulfide	Y		Y	
56-23-5	Carbon Tetrachloride	Y			
108-90-7	Chlorobenzene	Y		Y	
75-00-3	Chloroethane	Y		Y	
67-66-3	Chloroform	Y		Y	
74-87-3	Chloromethane	Y			
156-59-2	cis-1,2-Dichloroethene	Y		Y	
10061-01-5	cis-1,3-Dichloropropene	Y			
124-48-1	Dibromochloromethane	Y			
100-41-4	Ethylbenzene			Y	Y
75-09-2	Methylene chloride	Y		Y	
100-42-5	Styrene	Y			
127-18-4	Tetrachloroethene	Y		Y	
108-88-3	Toluene			Y	
156-60-5	trans-1,2-Dichloroethene			Y	
10061-02-6	trans-1,3-Dichloropropene	Y			
79-01-6	Trichloroethene	Y		Y	
75-01-4	Vinyl chloride	Y		Y	
1330-20-7	Xylenes (Total)	Y		Y	Y

Notes:
Y : COPC for specific AOC (Max Detect exceeds Screening Level)
Y-nv : COPC due to lack of screening criteria

Table 2-30
Summary of Exposure Point Concentrations
Soil and Sediment
BROS Human Health Risk Assessment
Bridgeport, NJ

		BROS Property					
		AOC 1		AOC 3	AOC 6	BP	
COPC		Soil EPC Surface 0-6 in (mg/kg)	Soil EPC Subsurface 0-6 ft (mg/kg)	Soil EPC Subsurface 0-6 ft (mg/kg)	Soil EPC Subsurface 0-7 ft (mg/kg)	Soil EPC Surface 0-6 in (mg/kg)	Soil EPC Subsurface 0-6 ft (mg/kg)
Metals							
7429-90-5	Aluminum	10300 Max	12200 Max	Not a COPC	Not a COPC	13700 Max	8442.08 95 UCL(h)
7440-38-2	Arsenic	7.70 Max	20 Max	3 Max	1.2 Max	9.10 Max	66.76 95 UCL(h)
7440-47-3	Chromium	31.5 Max	140 Max	Not a COPC	Not a COPC	42.10 Max	66.76 95 UCL(h)
7439-89-6	Iron	20800 Max	29100 Max	Not a COPC	Not a COPC	25600 Max	25600 Max
7439-96-5	Manganese	530 1 Max	Not a COPC	Not a COPC	Not a COPC	587 1 Max	Not a COPC
7439-97-6	Mercury	0.1 1 Max	Not a COPC	Not a COPC	Not a COPC	0.14 1 Max	Not a COPC
7439-92-1	Lead	Not a COPC	537 Max	Not a COPC	Not a COPC	55.8 1 Max	83.98 95 UCL(h)
7440-28-0	Thallium	1.3 1 Max	Not a COPC	ND	Not a COPC	3.90 1 Max	Not a COPC
7440-62-2	Vanadium	Not a COPC	Not a COPC	Not a COPC	Not a COPC	62.8 1 Max	Not a COPC
SVOCs							
208-96-8	Acenaphthylene	ND	0.4 Max	ND	ND	ND	0.06 95 UCL(h)
50-32-8	Benzo(a)pyrene	Not a COPC	Not a COPC	Not a COPC	0.25 Max	0.073 1 Max	0.13 95 UCL(h)
191-24-2	Benzo(g,h,i)perylene	0.046 Max	0.046 Max	0.058 Max	0.082 Max	0.041 Max	0.09 95 UCL(h)
53-70-3	Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
91-20-3	Naphthalene	ND	19 Max	Not a COPC	Not a COPC	ND	Not a COPC
85-01-8	Phenanthrene	0.051 Max	7.2 Max	0.43 Max	6.5 Max	0.083 Max	0.439 95 UCL(h)
100-41-4	Ethylbenzene	NA	NA	ND	25 Max	ND	Not a COPC
1330-20-7	Xylenes (Total)	NA	NA	Not a COPC	73 Max	ND	Not a COPC
PCBs							
1336-36-3	Total PCBs	NA	11.06 Max	NA	16 Max	0.71 1 Max	9.80 Max

NA : Not analyzed
ND: Compound not detected in dataset
Not a COPC: Passed medium and AOC-specific screening evaluation
1: chemical is only COPC in residential exposures (resident, trespassing, recreation), not industrial.

Table 2-30
Summary of Exposure Point Con
Soil and Sediment
BROS Human Health Risk Assess
Bridgeport, NJ

COPC		Off-Property				Cedar Swamp		Little Timber Creek Swamp	
		AOC 2		AOC 4	AOC 5	CS -H1B (Culvert -Tide Gate)		LTCS-H3 (R130-R44)	
		Soil	Soil	Soil	Soil	Sediment		Sediment	
		EPC	EPC	EPC	EPC	EPC		EPC	
		Surface 0-6 in (mg/kg)	Subsurface 0-6 ft (mg/kg)	Subsurface 0-6 ft (mg/kg)	Subsurface 0-6 ft (mg/kg)	Surface 0-6 in (mg/kg)		Surface 0-6 in (mg/kg)	
Metals									
7429-90-5	Aluminum	Not a COPC	Not a COPC	Not a COPC	Not a COPC	NA		NA	
7440-38-2	Arsenic	5.7 Max	5.7 Max	1.8 Max	2.4 Max	NA		NA	
7440-47-3	Chromium	21.4 1 Max	Not a COPC	Not a COPC	Not a COPC	67	Max	104	Max
7439-89-6	Iron	13400 Max	13400 Max	Not a COPC	Not a COPC	NA		NA	
7439-96-5	Manganese	344 1 Max	Not a COPC	Not a COPC	Not a COPC	NA		NA	
7439-97-6	Mercury	0.1 1 Max	Not a COPC	Not a COPC	Not a COPC	0.6	Max	1.0	Max
7439-92-1	Lead	45.7 1 Max	244 Max	Not a COPC	Not a COPC	237	Max	416	Max
7440-28-0	Thallium	ND	ND	ND	ND	NA		NA	
7440-62-2	Vanadium	Not a COPC	Not a COPC	Not a COPC	Not a COPC	74	Max	82	Max
SVOCs									
208-96-8	Acenaphthylene	ND	0.23 Max	ND	ND	NA		NA	
50-32-8	Benzo(a)pyrene	0.34 Max	0.34 Max	ND	ND	NA		NA	
191-24-2	Benzo(g,h,i)perylene	0.18 Max	0.18 Max	ND	ND	NA		NA	
53-70-3	Dibenzo(a,h)anthracene	0.074 1 Max	Not a COPC	ND	ND	NA		NA	
91-20-3	Naphthalene	ND	Not a COPC	ND	ND	NA		NA	
85-01-8	Phenanthrene	0.33 Max	4.1 Max	ND	ND	NA		NA	
100-41-4	Ethylbenzene	NA	NA	NA	ND	NA		NA	
1330-20-7	Xylenes (Total)	NA	NA	NA	Not a COPC	NA		NA	
PCBs									
1336-36-3	Total PCBs	0.45 Max	3.0 Max	NA	NA	2.4	95 UCL(t)	5.7	Max

NA : Not analyzed
ND: Compound not detected in dataset
Not a COPC: Passed medium and AOC-specific screening evaluation
1: chemical is only COPC in residential exposures (resident, trespassing, recreation), not industrial.

800223

Table 2-31
Summary of Exposure Point Concentrations
Ground water and Surface Water
BROS Human Health Risk Assessment
Bridgeport, NJ

		BROS Property			Off-Property		Cedar Swamp	Little Timber Creek Swamp
	COPC	AOC 1a GW EPC (mg/L)	AOC 1 GW EPC (mg/L)	AOC 1 GW EPC (mg/L)	AOC 3 GW EPC (mg/L)	AOC 4 GW EPC (mg/L)	CS -H1B (Culvert -Tide Gate) SW EPC (mg/L)	LTCS-H3 (Route 130-Route 44) SW EPC (mg/L)
Metals								
7429-90-5	Aluminum	524 Max	0.855 Max	Not a COPC	473 Max	Not a COPC	0.145 Max	0.145 Max
7440-38-2	Arsenic	0.093 95 UCL(h)	ND	0.009 Max	0.006 95 UCL(h)	0.007 Max	ND	ND
7440-39-3	Barium	0.297 95 UCL(h)	Not a COPC	Not a COPC	Not a COPC	Not a COPC	Not a COPC	Not a COPC
7440-41-7	Beryllium	0.021 95 UCL(h)	ND	ND	0.0216 Max	ND	ND	ND
7440-47-3	Chromium	1.090 Max	ND	ND	0.969 Max	ND	ND	ND
7440-48-4	Cobalt	0.139 95 UCL(h)	ND	Not a COPC	0.104 Max	Not a COPC	ND	ND
7440-50-8	Copper	0.068 95 UCL(h)	ND	Not a COPC	Not a COPC	ND	ND	ND
7439-92-1	Lead	0.313 95 UCL(h)	ND	ND	0.147 Max	ND	ND	ND
7439-97-6	Mercury	0.000 95 UCL(h)	ND	ND	ND	ND	ND	ND
7440-02-0	Nickel	2.075 95 UCL(h)	Not a COPC	ND	0.451 Max	Not a COPC	ND	ND
7782-49-2	Selenium	0.052 95 UCL(h)	ND	ND	0.03 95 UCL(h)	ND	ND	ND
7440-28-0	Thallium	0.106 95 UCL(h)	0.013 Max	ND	0.05 95 UCL(h)	ND	ND	ND
7440-62-2	Vanadium	2.700 Max	ND	Not a COPC	2.08 Max	Not a COPC	ND	ND
7440-66-6	Zinc	1.640 Max	Not a COPC	Not a COPC	38.1 Max	Not a COPC	Not a COPC	Not a COPC
SVOCs								
105-67-9	2,4-Dimethylphenol	0.150 Max	ND	NA	NA	NA	ND	ND
91-57-6	2-Methylnapthalene	0.027 95 UCL(h)	ND	ND	Not a COPC	ND	ND	ND
99-09-2	3-Nitroaniline	0.001 95 UCL(h)	ND	ND	ND	ND	ND	ND
59-50-7	4-Chloro-3-methylphenol	0.001 Max	ND	NA	NA	NA	ND	ND
106-47-8	4-Chloroaniline	0.292 95 UCL(h)	ND	ND	0.072 Max	ND	ND	ND
108-10-1	4-Methyl-2-pentanone	0.226 95 UCL(h)	ND	ND	6.5 Max	ND	0.095 Max	ND
208-96-8	Acenaphthylene	0.002 95 UCL(h)	ND	ND	ND	ND	ND	ND
56-55-3	Benzo(a)anthracene	0.001 95 UCL(h)	ND	ND	ND	ND	ND	ND
50-32-8	Benzo(a)pyrene	0.001 95 UCL(h)	ND	ND	ND	ND	ND	ND
205-99-2	Benzo(b)fluoranthene	0.001 95 UCL(h)	ND	ND	ND	ND	ND	ND
191-24-2	Benzo(g,h,i)perylene	0.001 95 UCL(h)	ND	ND	ND	ND	ND	ND
111-44-4	bis(2-Chloroethyl)ether	1.800 Max	ND	ND	3.8 Max	0.48 Max	ND	ND
117-81-7	bis(2-Ethylhexyl)phthalate	0.007 95 UCL(h)	ND	ND	Not a COPC	ND	ND	ND
132-64-9	Dibenzofuran	0.001 95 UCL(h)	ND	ND	ND	ND	ND	ND
193-39-5	Indeno(1,2,3-cd)pyrene	0.001 95 UCL(h)	ND	ND	ND	ND	ND	ND
78-59-1	Isophorone	0.109 95 UCL(h)	ND	ND	2.300 Max	Not a COPC	ND	ND
91-20-3	Naphthalene	0.124 95 UCL(h)	ND	ND	0.044 Max	ND	ND	ND
98-95-3	Nitrobenzene	ND	ND	ND	0.001 Max	ND	ND	ND
85-01-8	Phenanthrene	0.011 95 UCL(h)	ND	ND	0.001 95 UCL(h)	ND	0.001 Max	0.001 Max
VOCs								
71-55-6	1,1,1-Trichloroethane	0.038 95 UCL(h)	ND	ND	0.038 95 UCL(h)	ND	Not a COPC	ND
79-34-5	1,1,2,2-Tetrachloroethane	ND	ND	ND	0.103 95 UCL(h)	0.01 Max	0.018 Max	ND
79-00-5	1,1,2-Trichloroethane	Not a COPC	ND	ND	0.014 95 UCL(h)	0.002 95 UCL(h)	0.022 Max	ND
75-34-3	1,1-Dichloroethane	0.094 95 UCL(h)	ND	ND	0.07 95 UCL(h)	Not a COPC	0.026 Max	ND
75-35-4	1,1-Dichloroethene	Not a COPC	ND	ND	0.06 95 UCL(h)	0.002 Max	0.026 Max	ND
120-82-1	1,2,4-Trichlorobenzene	0.004 95 UCL(h)	ND	ND	0.001 Max	ND	ND	ND
95-50-1	1,2-Dichlorobenzene	Not a COPC	ND	ND	0.076 Max	ND	ND	ND
107-06-2	1,2-Dichloroethane	0.080 95 UCL(h)	ND	ND	0.47 Max	0.032 Max	0.026 Max	ND
78-87-5	1,2-Dichloropropane	0.002 95 UCL(h)	ND	ND	0.103 Max	ND	0.02 Max	ND
541-73-1	1,3-Dichlorobenzene	0.001 95 UCL(h)	ND	ND	0.001 Max	ND	ND	ND
106-46-7	1,4-Dichlorobenzene	0.001 95 UCL(h)	ND	ND	0.006 Max	ND	ND	ND
78-93-3	2-Butanone	0.179 95 UCL(h)	ND	ND	5.1 Max	ND	0.13 Max	ND
591-78-6	2-Hexanone	Not a COPC	ND	ND	Not a COPC	ND	0.094 Max	ND
67-64-1	Acetone	1.973 95 UCL(h)	ND	ND	37.5 Max	Not a COPC	0.15 Max	ND
71-43-2	Benzene	0.915 Max	ND	ND	0.79 95 UCL(h)	0.043 Max	0.022 Max	ND
75-27-4	Bromodichloromethane	ND	ND	ND	ND	ND	0.024 Max	ND
75-25-2	Bromoform	ND	ND	ND	ND	ND	0.023 Max	ND
75-15-0	Carbon disulfide	0.032 95 UCL(h)	ND	ND	2.2 Max	Not a COPC	0.027 Max	ND
56-23-5	Carbon Tetrachloride	ND	ND	ND	ND	ND	0.029 Max	ND
108-90-7	Chlorobenzene	0.019 95 UCL(h)	ND	ND	0.08 Max	Not a COPC	0.023 Max	ND
75-00-3	Chloroethane	0.015 95 UCL(h)	ND	ND	0.01 95 UCL(h)	ND	0.017 Max	ND
67-66-3	Chloroform	0.011 95 UCL(h)	ND	ND	0.07 Max	0.015 Max	0.024 Max	ND

800224

Table 2-31
Summary of Exposure Point Concentrations
Ground water and Surface Water
BROS Human Health Risk Assessment
Bridgeport, NJ

		BROS Property			Off-Property		Cedar Swamp	Little Timber Creek Swamp
	COPC	AOC 1a GW EPC (mg/L)	AOC 1 GW EPC (mg/L)	AOC 1 GW EPC (mg/L)	AOC 3 GW EPC (mg/L)	AOC 4 GW EPC (mg/L)	CS -H1B (Culvert -Tide Gate) SW EPC (mg/L)	LTCS-H3 (Route 130-Route 44) SW EPC (mg/L)
74-87-3	Chloromethane	Not a COPC	ND	ND	Not a COPC	ND	0.017 Max	ND
156-59-2	cis-1,2-Dichloroethene	6.950 95 UCL(h)	ND	ND	1.7 Max	0.056 Max	0.026 Max	ND
10061-01-5	cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.021 Max	ND
124-48-1	Dibromochloromethane	ND	ND	ND	ND	ND	0.024 Max	ND
10061-02-6	trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	0.021 Max	ND
100-41-4	Ethylbenzene	0.328 95 UCL(h)	ND	ND	0.44 Max	ND	Not a COPC	ND
75-09-2	Methylene chloride	0.040 95 UCL(h)	ND	ND	2.4 Max	ND	0.025 Max	ND
100-42-5	Styrene	ND	ND	ND	Not a COPC	ND	0.023 Max	ND
127-18-4	Tetrachloroethene	0.008 95 UCL(h)	ND	ND	0.067 Max	0.0009 95 UCL(h)	0.025 Max	ND
108-88-3	Toluene	2.500 Max	ND	ND	2.9 Max	ND	Not a COPC	ND
156-60-5	trans-1,2-Dichloroethene	0.005 95 UCL(h)	ND	ND	0.024 Max	Not a COPC	Not a COPC	ND
79-01-6	Trichloroethene	0.590 Max	ND	ND	5.8 Max	0.04 95 UCL(t)	0.023 Max	ND
75-01-4	*Vinyl chloride*	*0.023 95 UCL(h)*	ND	ND	*0.093 Max*	*0.018 Max*	*0.018 Max*	ND
1330-20-7	Xylenes (Total)	3 Max	ND	ND	1.4 Max	Not a COPC	0.069 Max	ND
	PCBs							
1336-36-3	Total PCBs	0.264 Max	NA	NA	NA	NA	0.00003 Max	0.000084 Max

NA : Not analyzed
ND: Compound not detected in dataset
Not a COPC: Passed medium and AOC-specific screening evaluation

800225

Table 3-1a: Selection of Exposure Pathways for the BROS Property [Soil AOC BP, Shallow GW AOC-1a] (Excluding Hotspots 1 and 2 and Debris/Fill Areas)

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Routes	Type of Analysis	Rationale for Selection or Exclusion of Pathway
Current	Surface soil	Soil (0 to 2")	BP-uncapped areas	Groundskeeper	Adult	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Trespasser	Adolescent	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
		Soil (0' to 4' excluding ash)	Excavation in the 0' to 4' horizon	Construction worker	Adult	Ingestion	Quantitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols applicable to the Site preclude unregulated contact with chemical residuals, except for an accidental utility worker scenario.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Utility Worker	Adult	Ingestion	Quantitative	
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
	Ash	Ash from lagoon incineration	Excavation in the 2' to 4' horizon	Construction	Adult	Ingestion	Qualitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols applicable to the Site preclude unregulated contact with chemical residuals, except for an accidental utility worker scenario.
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
				Utility Work	Adult	Ingestion	Qualitative	
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
	Soil (1' to 10')	Air	Indoor air	Trespasser	Adolescent	Vapor inhalation	Quantitative	Possible intrusion of vapors from unsaturated soil into on-site buildings.
				Indoor worker	Adult	Vapor inhalation	Quantitative	
	Soil (1' to 10')	Air	Outdorr Air	Construction	Adult	Vapor inhalation	Qualitative	Pathway not assessed due to rapid dilution of any emitted vaors to overlyng air. Ambient monitoring during lagoon remediation did not show any chemicals above air criteria.
		Air	Outdorr Air	Utility Worker	Adult	Vapor inhalation	Qualitative	
	Shallow Groundwater	Air	Indoor air	Trespasser	Adolescent	Vapor inhalation	Quantitative	Potential intrusion of vapors from shallow groundwater into on-site buildings
				Indoor worker	Adult	Vapor inhalation	Quantitative	
		Groundwater	Surface of water table	Construction	Adult	Dermal contact	Quantitative	Possible contact with shallow groundwater during excavation.
Future	Surface soil	Soil (0 to 2")	BP-uncapped areas	Groundskeeper	Adult	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Trespasser	Adolescent	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
		Soil (0' to 4' excluding ash)	Excavation in the 0' to 4' horizon	Construction worker	Adult	Ingestion	Quantitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols applicable to the Site preclude unregulated contact with chemical residuals, except for an accidental utility worker scenario.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Utility Worker	Adult	Ingestion	Quantitative	
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
	Ash	Ash from lagoon incineration	Excavation in the 0' to 4' horizon	Construction	Adult	Ingestion	Qualitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols applicable to the Site preclude unregulated contact with chemical residuals, except for an accidental utility worker scenario.
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
				Utility Work	Adult	Ingestion	Qualitative	
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
	Soil (1' to 10')	Air	Outdorr Air	Construction	Adult	Vapor inhalation	Qualitative	Pathway not assessed due to rapid dilution of any emitted vaors to overlyng air. Ambient monitoring during lagoon remediation did not show any chemicals above air criteria.
		Air	Outdorr Air	Utility Worker	Adult	Vapor inhalation	Qualitative	
	Soil (1' to 10')	Air	Indoor air	Indoor worker	Adult	Vapor inhalation	Quantitative	Possible intrusion of vapors from unsaturated soil into on-site buildings.
	Shallow Groundwater	Air	Indoor air	Indoor worker	Adult	Vapor inhalation	Quantitative	Potential intrusion of vapors from shallow groundwater into on-property
		Groundwater	Surface of water table	Construction	Adult	Dermal contact	Quantitative	Possible contact with shallow groundwater during excavation.

800226

Table 3-1b: Selection of Exposure Pathways for Hot Spot 1 [Soil AOC 1, GW AOC-1a] on the BROS Property

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Routes	Type of Analysis	Rationale for Selection or Exclusion of Pathway
Current	Surface soil	Soil (0 to 2")	Uncapped areas	Groundskeeper	Adult	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Trespasser	Adolescent	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
		Soil (0' to 4' excluding ash)	Excavation in the 0' to 4' horizon	Construction worker	Adult	Ingestion	Quantitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Utility Worker	Adult	Ingestion	Quantitative	
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
	Ash	Ash from lagoon incineration	Excavation in the 2' to 4' horizon	Construction	Adult	Ingestion	Qualitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
				Utility Work	Adult	Ingestion	Qualitative	
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
	Shallow groundwater	Groundwater	Surface of water table	Construction	Adult	Dermal contact	Quantitative	Possible contact with shallow groundwater during excavation.
Future	Surface soil	Soil (0 to 2")	Uncapped areas	Groundskeeper	Adult	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Trespasser	Adolescent	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
		Soil (0' to 4' excluding ash)	Excavation in the 0' to 4' horizon	Construction worker	Adult	Ingestion	Quantitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Utility Worker	Adult	Ingestion	Quantitative	
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
	Ash	Ash from lagoon incineration	Excavation in the 2' to 4' horizon	Construction	Adult	Ingestion	Qualitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
				Utility Work	Adult	Ingestion	Qualitative	
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
	Soil (1' to 10')	Air	Indoor air	Indoor worker	Adult	Vapor inhalation	Quantitative	Possible intrusion of vapors from unsaturated soil into on-site buildings.
	Shallow Groundwater	Air	Indoor air	Indoor worker	Adult	Vapor inhalation	Quantitative	Potential intrusion of vapors from shallow groundwater into on-property
		Groundwater	Surface of water table	Construction	Adult	Dermal contact	Quantitative	Possible contact with shallow groundwater during excavation.

Table 3-1c: Selection of Exposure Pathways for Hot Spot 2 [Soil AOC 6, GW AOC-1a] on the BROS Property

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Routes	Type of Analysis	Rationale for Selection or Exclusion of Pathway
Current	Surface soil	Soil (0 to 2")	Uncapped areas	Groundskeeper	Adult	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Trespasser	Adolescent	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
		Soil (0' to 4' excluding ash)	Excavation in the 0' to 4' horizon	Construction worker	Adult	Ingestion	Quantitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Utility Worker	Adult	Ingestion	Quantitative	
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
	Ash	Ash from lagoon incineration	Excavation in the 2' to 4' horizon	Construction	Adult	Ingestion	Qualitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
				Utility Work	Adult	Ingestion	Qualitative	
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
	Shallow groundwater	Groundwater	Surface of water table	Construction	Adult	Dermal contact	Quantitative	Possible contact with shallow groundwater during excavation.
Future	Surface soil	Soil (0 to 2")	Uncapped areas	Groundskeeper	Adult	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Trespasser	Adolescent	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
		Soil (0' to 4' excluding ash)	Excavation in the 0' to 4' horizon	Construction worker	Adult	Ingestion	Quantitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Utility Worker	Adult	Ingestion	Quantitative	
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
	Ash	Ash from lagoon incineration	Excavation in the 2' to 4' horizon	Construction	Adult	Ingestion	Qualitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
				Utility Work	Adult	Ingestion	Qualitative	
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
	Soil (1' to 10')	Air	Indoor air	Indoor worker	Adult	Vapor inhalation	Quantitative	Possible intrusion of vapors from unsaturated soil into on-site buildings.
	Shallow Groundwater	Air	Indoor air	Indoor worker	Adult	Vapor inhalation	Quantitative	Potential intrusion of vapors from shallow groundwater into on-property
		Groundwater	Surface of water table	Construction	Adult	Dermal contact	Quantitative	Possible contact with shallow groundwater during excavation.

Table 3-1d: Selection of Exposure Pathways forDebris/Fill Area [Soil AOC 3, GW AOC-1a] on the BROS Property

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Routes	Type of Analysis	Rationale for Selection or Exclusion of Pathway
Current	Surface soil	Soil (0 to 2")	Uncapped areas	Groundskeeper	Adult	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Trespasser	Adolescent	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
		Soil (0' to 4' excluding ash)	Excavation in the 0' to 4' horizon	Construction worker	Adult	Ingestion	Quantitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Utility Worker	Adult	Ingestion	Quantitative	
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
	Ash	Ash from lagoon incineration	Excavation in the 2' to 4' horizon	Construction	Adult	Ingestion	Qualitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
				Utility Work	Adult	Ingestion	Qualitative	
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
	Shallow groundwater	Groundwater	Surface of water table	Construction	Adult	Dermal contact	Quantitative	Possible contact with shallow groundwater during excavation.
Future	Surface soil	Soil (0 to 2")	Uncapped areas	Groundskeeper	Adult	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Trespasser	Adolescent	Ingestion	Quantitative	While 2 feet of clean fill was placed over the majority of the site, sporadic surface detects of BROS COPC suggests the quantitative evaluation of surface soils (0 to 2") in uncapped areas.
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
		Soil (0' to 4' excluding ash)	Excavation in the 0' to 4' horizon	Construction worker	Adult	Ingestion	Quantitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
				Utility Worker	Adult	Ingestion	Quantitative	
						Dermal contact	Quantitative	
						Inhalation of dust	Quantitative	
	Ash	Ash from lagoon incineration	Excavation in the 2' to 4' horizon	Construction	Adult	Ingestion	Qualitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of ground water from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
				Utility Work	Adult	Ingestion	Qualitative	
						Dermal contact	Qualitative	
						Inhalation of dust	Qualitative	
	Soil (1' to 10')	Air	Indoor air	Indoor worker	Adult	Vapor inhalation	Quantitative	Possible intrusion of vapors from unsaturated soil into on-site buildings.
	Shallow Groundwater	Air	Indoor air	Indoor worker	Adult	Vapor inhalation	Quantitative	Potential intrusion of vapors from shallow groundwater into on-property
		Groundwater	Surface of water table	Construction	Adult	Dermal contact	Quantitative	Possible contact with shallow groundwater during excavation.

Table 3-1e: Selection of Exposure Pathways for the West Side Property [Soil AOC 5, Shallow GW AOC-1b]

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Routes	On-Site/Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Pathway
Current		Soil (6' to 10')	None	None		Ingestion, dermal, plant uptake		Qualitative assessment of plant uptake	No COPCs are identified at the soil/ground water interface at 6' to 10' below grade. No activities occur to that depth. Nearly all of the mass of crop roots are shallow, and there is no impact to crops.
		Shallow groundwater	None	None		Ingestion		None	No current use.
		Sediment (very limited area along the edge of Gaventa Pond)	None	None		Ingestion, dermal contact		Qualitative	The steep slope along the edge of the pond and the limited area above the pond surface precludes any significant direct contact (USEPA, 1989). Removal of residuals will be completed based on ecological risk reduction measures and the 1984 ROD.
Future		Soil (6' to 10')	Excavation into the 6' to 10' horizon	Construction worker		Ingestion, dermal contact and inhalation of soil-derived dust		Qualitative	Some limited COPCs are identified at the soil/ground water interface at 6' to 10' below grade but no activities are likely to occur to that depth. Remediation of NAPL is expected, consistent with NJAC 7:26E6-2. Future scenarios will deal only with exposures to post NAPL-remediation residuals.
		Air (Soil 6'–10' and shallow groundwater)	Residential building	Adult / child		Vapor inhalation		Quantitative	Viable potential pathway for possible intrusion of vapors from unsaturated soils and shallow ground water into on-property buildings if residential construction occurs on West Side Property.
		Shallow groundwater	Residential use	Adult / child		Ingestion, dermal contact and inhalation of vapors		Quantitative	Viable potential pathway if additional residential construction occurs on West Side Property and residents are not precluded from using ground water as a source of domestic water.
			Agricultural use - irrigation	Adult / child		Dermal and inhalation of vapors		Quantitative	Viable potential pathway if irrigation wells are installed on the property.
		Sediment (very limited area along a portion of the edge of the pond)	None	None		None		None	The steep slope along the edge of the pond and the limited area above the pond surface precludes any significant direct contact (USEPA, 1989). Remediation will occur in this area pursuant to the 1984 ROD and subsequent agreements with the USEPA related to potential ecological risk reduction measures.

Table 3-1f: Selection of Exposure Pathways for the South Side Property [Soil AOC 4, GW AOC-1c]

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Routes	On-Site/Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Pathway
Current		Soil (0' to 4')	Excavation in the 0' to 4' horizon	Construction worker		Ingestion, dermal contact, inhalation of soil-derived dust		Quantitative	Deed restrictions are in place. Potential exposure is limited.
		Shallow groundwater	Excavation in the 0' to 4' horizon	Construction worker		Dermal Contact		Quantitative	Deed restrictions are in place. Potential exposure is limited.
Future		Soil (0' to 4')	Excavation in the 0' to 4' horizon	Construction/Utility Worker worker		Ingestion, dermal contact, inhalation of soil-derived dust		Quantitative	New Jersey Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) limit potential exposure and preclude the use of groundwater from beneath the BROS Property (USEPA, 1989). In addition, health and safety protocols applicable to the Site preclude unregulated contact with chemical residuals, except for an accidental utility worker scenario.
		Shallow groundwater	Hypothetical fountain	Recreational area users		Ingestion		Quantitative	NJ Solid Waste Regulations and deed restrictions (due to ash placement in a landfill on-property) preclude the use of groundwater from beneath the BROS Property (USEPA, 1989). Nevertheless, a limited area outside this buffer zone exists where a well could be placed for recreational uses purposes.
			Excavation in the 0' to 4' horizon	Construction worker		Dermal contact		Quantitative	Deed restrictions are in place. Potential exposure is limited.

Table 3-1g: Selection of Exposure Pathways for the Drainage Swale Adjacent to the BROS Property [Soil AOC 2, GW AOC-1d]

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Routes	On-Site/Off-Site	Type of Analysis
Current		Soil (0' to 6')	Excavation in the 0' to 6' horizon	Construction worker/utility worker		Ingestion, dermal contact, inhalation of soil-derived dust		Quantitative
		Shallow groundwater	None	None		None		None
Future		Soil (0' to 6')	Excavation in the 0' to 6' horizon	Construction worker/utility worker		Ingestion, dermal contact, inhalation of soil-derived dust		Quantitative
		Shallow groundwater	None	None		None		None

Table 3-1h: Selection of Exposure Pathways for Deep (below 40' of ground surface) Groundwater

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Routes	On-Site/Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Pathway
Current		Groundwater [GW AOC-2]	None	None		Ingestion		None	GW AOC-2 is the Upper Middle PRM aquifer under the BROS Property but excluding the bottom 15 feet of the aquifer. No current use of this AOC.
		Groundwater [GW AOC-3]	None	None		Ingestion		None	GW AOC-3 is the base of the Upper Middle PRM aquifer under and north of Swindell Pond. No current use of this AOC.
		Groundwater [GW AOC-4]	None	None		None		None	GW AOC-4 is the base of the Upper Middle PRM aquifer downgradient from Swindell Pond and is comprised of the bottom 15 feet of the aquifer. There is no current use of groundwater from this AOC.
		Groundwater Sentinel Monitoring Wells	Residential use	Adult / child		Ingestion		None	All sentinel AOCs are below MCLs or other primary drinking water criteria.
Future		Groundwater [GW AOC-2]	None	None		None		None	GW AOC-2 is the Upper Middle PRM aquifer under the BROS Property but excluding the bottom 15 feet of the aquifer. Deed restrictions preclude the use of this part of the aquifer for any beneficial use.
		Groundwater [GW AOC-3]	Hypothetical Recreational Fountain	Adult / child		Ingestion		Quantitative	While unlikely, placement of a well without knowledge of groundwater use restrictions in this area is hypothetically possible.
		Groundwater [GW AOC-4]	Residential use	Adult / child		Ingestion, dermal and inhalation of vapors		Quantitative	GW AOC-4 is the base of the Upper Middle PRM aquifer downgradient from Swindell Pond and is comprised of the bottom 15 feet of the aquifer.
			Agricultural use - irrigation	Adult / child		Dermal and inhalation of vapors		Quantitative	
		Groundwater Sentinel Monitoring Wells	Residential use	Adult / child		Ingestion		None	Groundwater modeling indicates that all sentinel AOCs will remain below MCLs or other primary drinking water criteria.

Table 3-1i: Selection of Exposure Pathways for Surface Water and Sediment

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Routes	On-Site/Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Pathway
Current and Future		Surface water and sediment	Upstream portions of Little Timber Creek Swamp adjacent to and south of the I-295 [AOC LTCS-1 and LTCS-2A]	Hunters		Dermal contact and ingestion of sediment		Quantitative	Accessible from farm fields.
				Adult / child		Dermal contact and ingestion of sediment		Quantitative	Accessible to general recreational activities.
				Trespassers		Dermal contact and ingestion of sediment		Quantitative	Accessible from farm fields.
			Portions of Little Timber Creek Swamp adjacent to the Route 130 culvert [AOC LTCS–2B]	None		None		Qualitative	Accessibility is so limited by topography and density of plant growth that this very limited area is not considered to present a viable exposure pathway based on RAGS (USEPA, 1989) and best professional judgment. Remediation is planned in this area for ecological risk reduction.
			Portions of Little Timber Creek Swamp between Route 130 and Route 44 [AOC LTCS–3]	Hunters		Dermal contact and ingestion of sediment		Quantitative	Adjacent to farm fields and residences. Field observations of hunters and trappers.
				Adult / child		Dermal contact and ingestion of sediment		Quantitative	Accessible to general recreational activities.
				Trespassers		Dermal and ingestion		Quantitative	Adjacent to farm fields and residences.
			Portion of Cedar Swamp from the culvert towards the tide gate and then down the channel towards the Delware [AOC CS–1A]	Trespassers		Dermal and ingestion		Quantitative	Access possible via boat.
				Adult / child		Ingestion/dermal contact with sediment		Quantitative	Various recreational uses.
			Portion of Cedar Swamp from the culvert away from the tide gate [AOC CS-1B]	Trespassers		Dermal and ingestion		Quantitative	Access possible.
				Adult / child		Ingestion/dermal contact with sediment		Quantitative	Various recreational uses.

Table 3-2. Summary of February, April and August 2000 Fish Surveys of Little Timber Creek in Cedar Swamp.

Station	Method	Date	Common Name	Scientific Name	Length (mm)
MT #1	Minnow trap	02/29/2000	--	--	--
MT #2	Minnow trap	02/29/2000	Striped killifish	*Fundulus majalis*	67
	Minnow trap	02/29/2000	Striped killifish	*Fundulus majalis*	53
	Minnow trap	02/29/2000	Striped killifish	*Fundulus majalis*	49
	Minnow trap	02/29/2000	Striped killifish	*Fundulus majalis*	51
	Minnow trap	02/29/2000	Striped killifish	*Fundulus majalis*	52
MT #3	Minnow trap	02/29/2000	Banded killifish	*Fundulus diaphanus*	21
MT #4	Minnow trap	02/29/2000	--	--	--
FN	Fyke net	02/29/2000	Banded killifish	*Fundulus diaphanus*	75
	Fyke net	02/29/2000	White perch	*Morone americana*	110
	Fyke net	02/29/2000	White perch	*Morone americana*	135
	Fyke net	02/29/2000	White perch	*Morone americana*	130
	Fyke net	02/29/2000	Brown bullhead	*Ameiurus nebulosus*	250
	Fyke net	02/29/2000	Brown bullhead	*Ameiurus nebulosus*	280
MT #1	Minnow trap	03/01/2000	--	--	--
MT #2	Minnow trap	03/01/2000	--	--	--
MT #3	Minnow trap	03/01/2000	--	--	--
FN	Fyke net	03/01/2000	Channel catfish	*Ictalurus punctatus*	435
	Fyke net	03/01/2000	Channel catfish	*Ictalurus punctatus*	315
	Fyke net	03/01/2000	Channel catfish	*Ictalurus punctatus*	276
	Fyke net	03/01/2000	Channel catfish	*Ictalurus punctatus*	272
	Fyke net	03/01/2000	Brown bullhead	*Ameiurus nebulosus*	250
	Fyke net	03/01/2000	Brown bullhead	*Ameiurus nebulosus*	290
	Fyke net	03/01/2000	Brown bullhead	*Ameiurus nebulosus*	236
	Fyke net	03/01/2000	Brown bullhead	*Ameiurus nebulosus*	238
	Fyke net	03/01/2000	Brown bullhead	*Ameiurus nebulosus*	242
	Fyke net	03/01/2000	Brown bullhead	*Ameiurus nebulosus*	197
	Fyke net	03/01/2000	White perch	*Morone americana*	74
	Fyke net	03/01/2000	White perch	*Morone americana*	160
	Fyke net	03/01/2000	White perch	*Morone americana*	162
	Fyke net	03/01/2000	White perch	*Morone americana*	135
	Fyke net	03/01/2000	White perch	*Morone americana*	137
	Fyke net	03/01/2000	Yellow perch	*Perca flavescens*	161
	Fyke net	03/01/2000	Yellow perch	*Perca flavescens*	113
	Fyke net	03/01/2000	Bluegill	*Lepomis macrochirus*	70
	Fyke net	03/01/2000	Banded killifish	*Fundulus diaphanus*	50
	Fyke net	03/01/2000	Gizzard shad	*Dorosoma cepedianum*	205
	Fyke net	03/01/2000	Alewife	*Alosa pseudoharengus*	220
FN #1	Fyke net	04/18/2000	--	--	--
MT #1	Minnow trap	04/18/2000	--	--	--
EP #1	Eel pot	04/18/2000	--	--	--
MT #2	Minnow trap	04/18/2000	--	--	--
EP #2	Eel pot	04/18/2000	--	--	--
FN #1	Fyke net	04/19/2000	Common Shiner	*Luxilus cornutus*	83
	Fyke net	04/19/2000	White Perch	*Morone americana*	174
MT #1	Minnow trap	04/19/2000	--	--	--
EP #1	Eel pot	04/19/2000	--	--	--
MT #2	Minnow trap	04/19/2000	--	--	--
EP #2	Eel pot	04/19/2000	Common Shiner	*Luxilus cornutus*	70
FN #2	Fyke net	04/20/2000	Channel Catfish	*Ictalurus punctatus*	455
	Fyke net	04/20/2000	White Perch	*Morone americana*	234
	Fyke net	04/20/2000	Pumpkinseed	*Lepomis gibbosus*	103
	Fyke net	04/20/2000	American Shad	*Alosa sapidissima*	205
EP #3	Eel pot	04/20/2000	--	--	--
FN #3	Fyke net	04/20/2000	White Perch	*Morone americana*	121
	Fyke net	04/20/2000	White Perch	*Morone americana*	110
	Fyke net	04/20/2000	White Perch	*Morone americana*	92
	Fyke net	04/20/2000	White Perch	*Morone americana*	121
	Fyke net	04/20/2000	White Perch	*Morone americana*	99
	Fyke net	04/20/2000	White Perch	*Morone americana*	109
	Fyke net	04/20/2000	White Perch	*Morone americana*	126
	Fyke net	04/20/2000	White Perch	*Morone americana*	190
	Fyke net	04/20/2000	White Perch	*Morone americana*	97
	Fyke net	04/20/2000	American Eel	*Anguilla rostrata*	77
EP #4	Eel pot	04/20/2000	--	--	--
FN #2	Fyke net	04/21/2000	White Perch	*Morone americana*	131
EP #3	Eel pot	04/21/2000	--	--	--
EP #4	Eel pot	04/21/2000	--	--	--

Table 3-2. Summary of February, April and August 2000 Fish Surveys of Little Timber Creek in Cedar Swamp.

Station	Method	Date	Common Name	Scientific Name	Length (mm)
MT #1	Minnow trap	8/1 - 8/3	--	--	--
MT #2	Minnow trap	8/1 - 8/3	Mummichog	*Fundulus heteroclitus*	(ND)
FN	Fyke net	08/01/2000	White Perch	*Morone americana*	
			White Perch	*Morone americana*	
			White Perch	*Morone americana*	
			White Perch	*Morone americana*	
			White Perch	*Morone americana*	
			White Perch	*Morone americana*	
			White Perch	*Morone americana*	
			White Perch	*Morone americana*	222
			White Perch	*Morone americana*	171
			White Perch	*Morone americana*	191
			White Perch	*Morone americana*	152
			White Perch	*Morone americana*	184
			White Perch	*Morone americana*	184
			White Perch	*Morone americana*	165
			White Perch	*Morone americana*	191
			White Perch	*Morone americana*	181
			White Perch	*Morone americana*	210
			White Perch	*Morone americana*	178
			White Perch	*Morone americana*	127
			White Perch	*Morone americana*	159
			White Perch	*Morone americana*	152
			White Perch	*Morone americana*	146
			White Perch	*Morone americana*	146
			Pumpkinseed	*Lepomis gibbosus*	(ND)
MSN	Minnow Seine Net	08/03/2000	Mummichog	*Fundulus heteroclitus*	varied
			Striped killifish	*Fundulus majalis*	varied
			White Perch	*Morone americana*	38
			White Perch	*Morone americana*	38
			Inland Silverside	*Menidia beryllina*	varied
			Largemouth bass	*Micropterus salmoides*	102

Note:
One Northern crawfish (*Orconectes viriles*) was collected in the minnow trap MT#2 on 3/1/2000.
Two healthy redbelly turtles (*Pseudemys rubriventris*) were present in FN#2 collected on 4/21/2000. These were released unharmed.

Table 3-3
Summary of Exposure Parameters
Current Trespasser (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter	Age	Basis
Common Parameters	**Age 10<18**	
Exposure Frequency (days/year)	12	1 day/month throughout the year
Exposure Duration (years)	8	Professional judgment.
Body weight (kg)	50	EPA 1997 50th %ile body weight for males/females 10<18
Carcinogenic averaging time (days)	27375	EPA 1997 based on lifetime of 75 years
Noncancer averaging time (days)	2920	Consistent with exposure duration
Cancer slope factor (1/(mg/kg-day))	Chemical-specific	See Table 4-1
Reference dose (mg/kg-day)	Chemical-specific	See Table 4-1
Soil Ingestion Pathway		
Soil ingestion rate (mg/day)	100	Upper bound estimate based on EPA, 1997
Fraction contaminated (unitless)	0.5	Professional judgment based on brief time on-site
Oral absorption factor (unitless)	Chemical-specific	See Table 3-9
Conversion factor (kg/mg)	1.00E-06	
Dermal Contact with Soil		
Dermal adherence factor (mg/cm2)	0.3	EPA 2001 upper bound rate for teenage soccer players
Exposed skin surface area (cm^2/day)	5353	Average of 50th percentile surface area for males/females including hands, 1/2 arms, 1/2 legs and feet (EPA, 1997)
Dermal absorption factor (unitless)	Chemical-specific	See Table 3-9
Conversion factor (kg/mg)	1.00E-06	
Inhalation of Particulates		
Inhalation rate (m^3/hour)	1.2	EPA 1997 rate for children engaged in moderate activity
Exposure time (hours/day)	1	Brief visit to the site during trespassing activity
Concentration in soil (mg/kg)	Chemical-specific	See Table 2-30
Respirable particulate matter ($\mu g/m^3$)	66	Average of maximum daily PM10 for 10 sampling station (NJDEP, 2001)
Conversion factor (kg/µg)	1.00E-09	
Inhalation of Vapor	***Adolescent***	
Concentration in air ($\mu g/m^3$)	Chemical-specific	See Appendix Tables A-14 through A-20
Exposure frequency (days/year)	4 (CTE); 12 (RME)	5 days/week for 48 weeks/year
Exposure Duration (years)	8 (CTE and 25)	Upper bound occupational exposure (EPA, 1997)
Carcinogenic averaging time (days)	27375 (CTE and RME)	Lifetime exposure of 75 years (USEPA 1997)
Noncancer averaging time (days)	2920 (CTE and RME)	Consistent with exposure duration
Unit Risk Factor ($1/(\mu g/m^3)$)	Chemical-specific	See Table 4-1
Reference concentration (mg/m^3)	Chemical-specific	See Table 4-1

Note:
Inhalation rates, exposure times, and body weights are not independent entries for the Johnson & Ettinger vapor intrusion model (USEPA, 2003)

Applicable AOCs

Surface Soil (0-6 in)	Vapor Intrusion (Surface Soil plus water table Ground water)
Soil AOC 1	Pepper Building plus Soil AOC 2
Soil AOC 3 - No data, no evaluation	Soil AOC 2
Soil AOC 6 - No data, no evaluation	Soil AOC 1
Soil AOC BP	West Side Property
	South Side Property
	Rest of BROS Property

Table 3-4
Summary of Exposure Parameters
Current Groundskeeper (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter	Age	Basis
Common Parameters	**Adult**	
Exposure Frequency (days/year)	30	1 day/month throughout the year
Exposure Duration (years)	25	Professional judgment.
Body weight (kg)	71.8	EPA 1997 50th %ile body weight for males/females 10<18
Carcinogenic averaging time (days)	27375	EPA 1997 based on lifetime of 75 years
Noncancer averaging time (days)	9125	Consistent with exposure duration
Cancer slope factor (1/(mg/kg-day))	Chemical-specific	See Table 4-1
Reference dose (mg/kg-day)	Chemical-specific	See Table 4-1
Soil Ingestion Pathway		
Soil ingestion rate (mg/day)	100	Upper bound estimate based on EPA, 1997
Fraction contaminated (unitless)	1.0	Professional judgment based on brief time on-site
Oral absorption factor (unitless)	Chemical-specific	See Table 3-9
Conversion factor (kg/mg)	1.00E-06	
Dermal Contact with Soil		
Dermal adherence factor (mg/cm2)	0.1	EPA (2001) upper bound rate for groundskeepers
Exposed skin surface area (cm2/day)	2584	Average of 50th percentile surface area for adult males/females including hands, face and forearms (EPA, 1997)
Dermal absorption factor (unitless)	Chemical-specific	See Table 3-9
Conversion factor (kg/mg)	1.00E-06	
Inhalation of Particulates		
Inhalation rate (m3/hour)	1.5	EPA (1997) rate for adults engaged in moderate activity
Exposure time (hours/day)	8	Full workday at the site
Concentration in soil (mg/kg)	Chemical-specific	See Table 2-30
Respirable particulate matter (µg/m3)	66	Average of maximum daily PM10 for 10 sampling station (NJDEP, 2001)
Conversion factor (kg/µg)	1.00E-09	

Applicable AOCs
Surface Soil (0-6 in)
Soil AOC 1
Soil AOC 3 - No data, no evaluation
Soil AOC 6 - No data, no evaluation
Soil AOC BP

Table 3-5a
Summary of Exposure Parameters
Current/Future Construction Worker (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter	Values	Basis
Common Parameters	**Adult**	
Exposure Duration (years)	1	Professional judgment
Body weight (kg)	71.8	EPA 1997 body weight for adults
Carcinogenic averaging time (days)	27375	EPA 1997 based on lifetime of 75 years
Noncancer averaging time (days)	365	Consistent with exposure duration
Cancer slope factor (1/(mg/kg-day))	Chemical-specific	See Table 4-1
Reference dose (mg/kg-day)	Chemical-specific	See Table 4-1
Ingestion of Surface Soil		
Exposure frequency (days/year)	80	5 days/week for 4 months
Soil ingestion rate (mg/day)	100	Upper bound estimate based on EPA, 1997
Fraction contaminated (unitless)	1.0	Professional judgment
Oral absorption factor (unitless)	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1E-06	
Ingestion of Subsurface Soil		
Exposure frequency (days/year)	20	5 days/week for 1 month during excavation only
Soil ingestion rate (mg/day)	100	Upper bound estimate based on EPA, 1997
Fraction contaminated (unitless)	1.0	Professional judgment
Oral absorption factor (unitless)	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1E-06	
Dermal Contact with Surface Soil		
Exposure frequency (days/year)	80	5 days/week for 4 months
Dermal adherence factor (mg/cm2)	0.3	EPA 2001 upper bound rate for construction workers
Exposed skin surface area (cm2/day)	2584	Average female/male face, hand and forearms in EPA, 1997
Dermal absorption factor (unitless)	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1.00E-06	
Dermal Contact with Subsurface Soil		
Exposure frequency (days/year)	20	5 days/week for 1 month during excavation only
Dermal adherence factor (mg/cm2)	0.3	EPA 2001 upper bound rate for construction workers
Exposed skin surface area (cm2/day)	2584	Average female/male face, hand and forearms in EPA, 1997
Dermal absorption factor (unitless)	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1.00E-06	

Table 3-5a
Summary of Exposure Parameters
Current/Future Construction Worker (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter	Values	Basis
Inhalation of Particulates (originating from subsurface soil)		
Exposure frequency	80	5 days/week for 4 months
Inhalation rate (m3/hour)	1.5	Upper bound EPA (1997) rate for outdoor workers engaged in moderate activity
Exposure time (hours/day)	8	Full work day
Concentration in soil (mg/kg)	Chemical-specific	See Table 2-30
Respirable particulate matter (µg/m3)	150	National ambient air quality maximum standard for inhalable particulates (NJDEP, 2001)
Conversion factor (kg/µg)	1.00E-09	
Dermal Contact with Ground water		
Exposure frequency (days/year)	4	1 day/week for 1 month during excavation only
Concentration in water (mg/L)	Chemical-specific	See Table 2-31
Exposed skin surface area (cm2/event)	1980	Hands and forearms in EPA, 1997
Permeability coefficient (cm/hour)	Chemical-specific	See Table 3-11
Exposure time (hours/day)	1	Accidental direct contact during the work day
Conversion factor (L/cm3)	1E-03	

Notes:

Applicable AOCs

Surface Soil (0-6 in)	Subsurface Soil (0-6ft)	Ground water (Shallow)
Soil AOC 1	Soil AOC 1	GW AOC 1a
Soil AOC 2	Soil AOC 2	GW AOC 1c
Soil AOC 3 - *No surface data, no evaluation*	Soil AOC 3	
Soil AOC 4 - No surface data, no evaluation	Soil AOC 4	
Soil AOC 5 - No surface data, no evaluation	Soil AOC 5	
Soil AOC 6 - No surface data, no evaluation	Soil AOC 6 - 7 ft bottom depth used for improving data robustness	
Soil AOC BP	Soil AOC BP	

As alternatives, USEPA suggested that a soil ingestion rate of 330 mg/day (from USEPA, 2001d) and soil dermal adherence factor of 0.2 mg/cm2 (USEPA, 2004a) be used. Use of these alternate values would change the risks calculated from the soil ingestion pathway (increase the risk by a factor of 3.3 times) and the risks from the dermal pathway (decrease the risk by a factor of 4.5 times) than the exposure assumptions shown in this table.

800240

Table 3-5b
Summary of Exposure Parameters
Current/Future Construction Worker (CTE)
BROS Human Health Risk Assessment
Bridgeport, NJ

CTE Parameter	Age	Basis
Common Parameters	**Adult**	
Exposure Duration (years)	0.5	Professional judgment
Body weight (kg)	71.8	EPA 1997 body weight for adults
Carcinogenic averaging time (days)	27375	EPA 1997 based on lifetime of 75 years
Noncancer averaging time (days)	365	Consistent with exposure duration
Cancer slope factor (1/(mg/kg-day))	Chemical-specific	See Table 4-1
Reference dose (mg/kg-day)	Chemical-specific	See Table 4-1
Ingestion of Surface Soil		
Exposure frequency (days/year)	80	5 days/week for 4 months
Soil ingestion rate (mg/day)	100	Upper bound estimate based on EPA, 1997
Fraction contaminated (unitless)	1.0	Professional judgment
Oral absorption factor (unitless)	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1E-06	
Ingestion of Subsurface Soil		
Exposure frequency (days/year)	20	5 days/week for 1 month during excavation only
Soil ingestion rate (mg/day)	100	Upper bound estimate based on EPA, 1997
Fraction contaminated (unitless)	1.0	Professional judgment
Oral absorption factor (unitless)	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1E-06	
Dermal Contact with Surface Soil		
Exposure frequency (days/year)	80	5 days/week for 4 months
Dermal adherence factor (mg/cm2)	0.3	EPA 2001 upper bound rate for construction workers
Exposed skin surface area (cm2/day)	2584	Average female/male face, hand and forearms in EPA, 1997
Dermal absorption factor (unitless)	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1.00E-06	
Dermal Contact with Subsurface Soil		
Exposure frequency (days/year)	20	5 days/week for 1 month during excavation only
Dermal adherence factor (mg/cm2)	0.3	EPA 2001 upper bound rate for construction workers
Exposed skin surface area (cm2/day)	2584	Average female/male face, hand and forearms in EPA, 1997
Dermal absorption factor (unitless)	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1.00E-06	

Table 3-5b
Summary of Exposure Parameters
Current/Future Construction Worker (CTE)
BROS Human Health Risk Assessment
Bridgeport, NJ

CTE Parameter	Age	Basis
Inhalation of Particulates (originating from subsurface soil)		
Exposure frequency	80	5 days/week for 4 months
Inhalation rate (m3/hour)	1.5	Upper bound EPA (1997) rate for outdoor workers engaged in moderate activity
Exposure time (hours/day)	8	Full work day
Concentration in soil (mg/kg)	Chemical-specific	See Table 2-30
Respirable particulate matter (µg/m3)	150	National ambient air quality maximum standard for inhalable particulates (NJDEP, 2001)
Conversion factor (kg/µg)	1.00E-09	
Dermal Contact with Ground water		
Exposure frequency (days/year)	4	1 day/week for 1 month during excavation only
Concentration in water (mg/L)	Chemical-specific	See Table 2-31
Exposed skin surface area (cm2/d)	904	Average for male and female hands in EPA, 1997
Permeability coefficient (cm/hour)	Chemical-specific	See Table 3-11
Exposure time (hours/day)	1	Accidental direct contact during the work day
Conversion factor (L/cm3)	1E-03	

Notes:
Applicable AOCs

Surface Soil (0-6 in)	Subsurface Soil (0-6ft)	Ground water (Shallow)
Soil AOC 1	Soil AOC 1	GW AOC 1a
Soil AOC 2	Soil AOC 2	GW AOC 1c
Soil AOC 3 - No surface data, no evaluation	Soil AOC 3	
Soil AOC 4 - No surface data, no evaluation	Soil AOC 4	
Soil AOC 5 - No surface data, no evaluation	Soil AOC 5	
Soil AOC 6 - No surface data, no evaluation	Soil AOC 6 - 7 ft bottom depth used for improving data robustness	
Soil AOC BP	Soil AOC BP	

As alternatives, USEPA suggested that a soil ingestion rate of 330 mg/day (from USEPA, 2001d) and soil dermal adherence factor of 0.2 mg/cm2 (USEPA, 2004a) be used. Use of these alternate values would change the risks calculated from the soil ingestion pathway (increase the risk by a factor of 3.3 times) and the risks from the dermal pathway (decrease the risk by a factor of 4.5 times) than the exposure assumptions shown in this table.

800242

Table 3-6
Summary of Exposure Parameters
Current/Future Utility Worker (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter	Age	Basis
Common Parameters	**Adult**	
Exposure Frequency (days/year)	5	Professional judgment. Assumed that utility installation or repair requires one work week
Exposure Duration (years)	1	Professional judgment.
Body weight (kg)	71.8	EPA 1997 body weight for adults
Carcinogenic averaging time (days)	27375	EPA 1997 based on lifetime of 75 years
Noncancer averaging time (days)	365	Consistent with exposure duration
Cancer slope factor (1/(mg/kg-day))	Chemical-specific	See Table 4-1
Reference dose (mg/kg-day)	Chemical-specific	See Table 4-1
Soil Ingestion Pathway (Surface and Subsurface Soils)		
Soil ingestion rate (mg/day)	100	Upper bound estimate based on EPA, 1997
Fraction contaminated (unitless)	1.0	Professional judgment
Oral absorption factor (unitless)	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1.00E-06	
Dermal Contact with Soil (Surface and Subsurface Soils)		
Dermal adherence factor (mg/cm2)	0.9	EPA 2001 upper bound rate for utility workers
Exposed skin surface area (cm2/day)	2584	Average female/male face, hand and forearms in EPA, 1997
Dermal absorption factor (unitless)	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1.00E-06	
Inhalation of Particulates (originating from subsurface soil)		
Inhalation rate (m3/hour)	1.5	EPA 1997 rate for outdoor workers engaged in moderate activity
Exposure time (hours/day)	8	Full work day
Concentration in soil (mg/kg)	Chemical-specific	See Table 2-30
Respirable particulate matter (µg/m3)	66	Average of maximum daily PM10 for 10 sampling station (NJDEP, 2001)
Conversion factor (kg/µg)	1.00E-09	

Applicable AOCs

Surface Soil (0-6 in)	Subsurface Soil (0-6ft)
Soil AOC 1	Soil AOC 1
Soil AOC 2	Soil AOC 2
Soil AOC 3 - No surface data, no evaluation	Soil AOC 3
Soil AOC 4 - No surface data, no evaluation	Soil AOC 4
Soil AOC 5 - No surface data, no evaluation	Soil AOC 5
Soil AOC 6 - No surface data, no evaluation	Soil AOC 6 - 7 ft bottom depth used for improving data robustness
Soil AOC BP	Soil AOC BP

Table 3-7
Summary of Exposure Parameters
Current Indoor Commercial Worker (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter	Age	Basis
Inhalation of Vapor	**Adult**	
Concentration in air ($\mu g/m^3$)	Chemical-specific	See Appendix Tables A-14 through A-20
Exposure frequency (days/year)	144 (CTE); 240 (RME)	5 days/week for 48 weeks/year
Exposure Duration (years)	7 (CTE); 25 (RME)	Upper bound occupational exposure (EPA, 1997)
Carcinogenic averaging time (days)	27375 (CTE and RME)	Lifetime exposure of 75 years (USEPA 1997)
Noncancer averaging time (days)	2555 (CTE); 9125 (RME)	Consistent with exposure duration
Unit Risk Factor ($1/(\mu g/m^3)$)	Chemical-specific	See Table 4-1
Reference concentration (mg/m^3)	Chemical-specific	See Table 4-1

Note:
Inhalation rates, exposure times, and body weights are not independent entries for the Johnson & Ettinger vapor intrusion model (USEPA, 2003)

Applicable AOCs
Vapor Intrusion (Surface Soil plus water table Ground water)
Pepper Building plus Soil AOC 2
Soil AOC 2
Soil AOC 1
West Side Property
South Side Property
Rest of BROS Property

Table 3-8a
Summary of Exposure Parameters
Current/Future Residential Use (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter	Age		Basis
Common Parameters	**Adult/Older Child**	**0-5 Child**	
Exposure frequency (days/year)	350	350	Daily exposure minus 2 weeks vacation time
Exposure Duration (years)	24	6	30-year upper bound residence time in EPA 1997
Body weight (kg)	71.8	14.3	Average male/female body weight for age group (EPA, 1997)
Carcinogenic averaging time (days)	27375	27375	EPA 1997
Noncancer averaging time (days)	8760	2190	Consistent with exposure duration for age group
Cancer slope factor (1/(mg/kg-day))	Chemical-specific	Chemical-specific	See Table 4-1
Reference dose (mg/kg-day)	Chemical-specific	Chemical-specific	See Table 4-1
Inhalation of Vapor During Showering/Bathing			
Concentration in air (mg/m3)	Chemical-specific	Chemical-specific	See Appendix Tables B-49 through B-64
Inhalation rate (m3/hour)	0.5	0.4	EPA 1997 data for short-term sedentary activities
Exposure time (hours/day)	0.2	0.2	EPA, 1989
Dermal Contact with Ground water During Showering/Bathing			
Concentration in water (mg/L)	Chemical-specific	Chemical-specific	See Table 2-31
Exposed skin surface area (cm2/event)	20000	6880	Mean total surface area for ages 2<7 and adults per (EPA, 1997)
Permeability coefficient (cm/hour)	Chemical-specific	Chemical-specific	See Table 3-11
Exposure time (hours/day)	0.2	0.53	EPA, 1989
Conversion factor (L/cm3)	1E-03	1E-03	
Ingestion of Ground water			
Concentration in water (mg/L)	Chemical-specific	Chemical-specific	See Table 2-31
Ingestion rate (L/day)	2.3	1.5	90th percentile for adults and young children (EPA 1997)

Applicable AOCs

Ground water (Shallow)	Ground water (Deep)
GW AOC 1b	GW AOC 4

Table 3-8b
Summary of Exposure Parameters
Current/Future Residential Use (CTE)
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter	Age		Basis
Common Parameters	**Adult/Older Child**	**0-5 Child**	
Exposure frequency (days/year)	350	350	Daily exposure minus 2 weeks vacation time
Exposure Duration (years)	24	6	30-year upper bound residence time in EPA 1997
Body weight (kg)	71.8	14.3	Average male/female body weight for age group (EPA, 1997)
Carcinogenic averaging time (days)	27375	27375	EPA 1997
Noncancer averaging time (days)	8760	2190	Consistent with exposure duration for age group
Cancer slope factor (1/(mg/kg-day))	Chemical-specific	Chemical-specific	See Table 4-1
Reference dose (mg/kg-day)	Chemical-specific	Chemical-specific	See Table 4-1
Inhalation of Vapor During Showering/Bathing			
Concentration in air (mg/m3)	Chemical-specific	Chemical-specific	See Appendix Tables B-49 through B-64
Inhalation rate (m3/hour)	0.5	0.4	EPA 1997 data for short-term sedentary activities
Exposure time (hours/day)	0.2	0.2	EPA, 1989
Dermal Contact with Ground water During Showering/Bathing			
Concentration in water (mg/L)	Chemical-specific	Chemical-specific	See Table 2-31
Exposed skin surface area (cm2/event)	20000	6880	Mean total surface area for ages 2<7 and adults per (EPA, 1997)
Permeability coefficient (cm/hour)	Chemical-specific	Chemical-specific	See Table 3-11
Exposure time (hours/day)	0.2	0.53	EPA, 1989
Conversion factor (L/cm3)	1E-03	1E-03	
Ingestion of Ground water			
Concentration in water (mg/L)	Chemical-specific	Chemical-specific	See Table 2-31
Ingestion rate (L/day)	1.3	0.87	50th percentile for adults and young children (EPA 1997)

Applicable AOCs

Ground water (Shallow)
GW AOC 1b

Ground water (Deep)
GW AOC 4

Table 3-9a
Summary of Exposure Parameters
Current/Future Recreational Use (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter	Age		Basis
Common Parameters	**Adult**	**1-6 Year Child**	
Exposure Duration (years)	24	6	Upper bound residence time (EPA 1997)
Body weight (kg)	71.8	16.6	Average male/female body weight for age group (EPA, 1997)
Carcinogenic averaging time (days)	27375	27375	Lifetime of 75 years (EPA, 1997)
Noncancer averaging time (days)	8760	2190	Consistent with exposure duration
Cancer slope factor (1/(mg/kg-day))	Chemical-specific	Chemical-specific	See Table 4-1
Reference dose (mg/kg-day)	Chemical-specific	Chemical-specific	See Table 4-1
Soil/Sediment Ingestion Pathway			
Soil ingestion rate (mg/day)	100	200	Upper bound ingestion rate based on EPA 1997
Exposure frequency (days/year)	8	8	1 day/month for 8 months/year
Fraction contaminated (unitless)	0.5	0.5	Professional judgment
Oral absorption factor (unitless)	Chemical-specific	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1.00E-06	1.00E-06	
Dermal Contact with Soil/Sediment			
Dermal adherence factor (mg/cm2)	0.3	0.4	Upper bound estimate for adult gardeners and children playing in dry soil (EPA, 2001)
Exposed skin surface area (cm2/day)	4940	2380	Hands, forearms, lower legs and feet (EPA, 1997)
Dermal absorption factor (unitless)	Chemical-specific	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1E-06	1E-06	
Dermal Contact with Surface Water			
Concentration in water (mg/L)	Chemical-specific	Chemical-specific	See Table 2-31
Exposed skin surface area (cm2/event)	2206	807	Average of Male/Female hands, forearms in EPA 1997
Permeability coefficient (cm/hour)	Chemical-specific	Chemical-specific	See Table 3-11
Exposure time (hours/day)	1	1	Professional judgment
Conversion factor (L/cm3)	1.00E-03	1.00E-03	
Ingestion of Ground water			
Concentration in water (mg/L)	Chemical-specific	Chemical-specific	See Table 2-31
Ingestion rate (L/day)	2.3	1.5	90th percentile for adults and young children (EPA 1997)
Fraction contaminated (unitless)	0.1	0.1	Professional judgment

Applicable AOCs

Ground water (Shallow)
GW AOC 1c

Surface Water
Cedar Swamp: CS H1 (Culvert to Tide Gate)
Little Timber Creek Swamp: LTCS H3 (Route 130 - Route 44)

Ground water (Deep)
GW AOC 3

Sediment (0-6 in)
Cedar Swamp: CS H1 (Culvert to Tide Gate)
Little Timber Creek Swamp: LTCS H3 (Route 130 - Route 44)

Table 3-9b
Summary of Exposure Parameters
Current/Future Recreational Use (CTE)
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter	Age		Basis
Common Parameters	**Adult**	**1-6 Year Child**	
Exposure Duration (years)	24	6	Upper bound residence time (EPA 1997)
Body weight (kg)	71.8	16.6	Average male/female body weight for age group (EPA, 1997)
Carcinogenic averaging time (days)	27375	27375	Lifetime of 75 years (EPA, 1997)
Noncancer averaging time (days)	8760	2190	Consistent with exposure duration
Cancer slope factor (1/(mg/kg-day))	Chemical-specific	Chemical-specific	See Table 4-1
Reference dose (mg/kg-day)	Chemical-specific	Chemical-specific	See Table 4-1
Soil/Sediment Ingestion Pathway			
Soil ingestion rate (mg/day)	100	200	Upper bound ingestion rate based on EPA 1997
Exposure frequency (days/year)	**4**	**4**	Professional judgment: On-half as much as RME (summer months)
Fraction contaminated (unitless)	0.5	0.5	Professional judgment
Oral absorption factor (unitless)	Chemical-specific	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1.00E-06	1.00E-06	
Dermal Contact with Soil/Sediment			
Dermal adherence factor (mg/cm2)	0.3	0.4	Upper bound estimate for adult gardeners and children playing in dry soil (EPA, 2001
Exposed skin surface area (cm2/day)	4940	2380	Hands, forearms, lower legs and feet (EPA, 1997)
Dermal absorption factor (unitless)	Chemical-specific	Chemical-specific	See Table 3-11
Conversion factor (kg/mg)	1E-06	1E-06	
Dermal Contact with Surface Water			
Concentration in water (mg/L)	Chemical-specific	Chemical-specific	See Table 2-31
Exposed skin surface area (cm2/event)	2206	807	Average of Male/Female hands, forearms in EPA 1997
Permeability coefficient (cm/hour)	Chemical-specific	Chemical-specific	See Table 3-11
Exposure time (hours/day)	**0.5**	**0.5**	Professional judgment
Conversion factor (L/cm3)	1.00E-03	1.00E-03	
Ingestion of Ground water			
Concentration in water (mg/L)	Chemical-specific	Chemical-specific	See Table 2-31
Ingestion rate (L/day)	**1.3**	**0.87**	50th percentile for adults and young children (EPA 1997)
Fraction contaminated (unitless)	0.1	0.1	Professional judgment

Applicable AOCs
Ground water (Deep)
GW AOC-3

800248

Table 3-10a
Summary of Exposure Parameters
Agricultural Use (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter	Age		Basis
Common Parameters	**Adult**	**Young Child**	
Exposure Duration (years)	30	6	Upper bound residence time in EPA 1997
Body weight (kg)	71.8	16.6	Average male/female body weight for age group (EPA, 1997)
Carcinogenic averaging time (days)	27375	27375	EPA 1997 for lifetime
Noncancer averaging time (days)	10950	2190	Consistent with exposure duration
Cancer slope factor (1/(mg/kg-day))	Chemical-specific	Chemical-specific	See Table 4-1
Reference dose (mg/kg-day)	Chemical-specific	Chemical-specific	See Table 4-1
Inhalation of Vapor During Irrigation			
Exposure frequency (days/year)	72	72	3 days of irrigation per week 6 months/year
Concentration in air (mg/m3)	Chemical-specific	Chemical-specific	See Appendix Tables B-65 through B-68
Inhalation rate (m3/hour)	1.5	1.2	EPA 1997 for individuals engaged in moderate activity outdoors
Exposure time (hours/day)	1	1	Brief exposure during irrigation
Dermal Contact with Ground water			
Concentration in water (mg/L)	Chemical-specific	Chemical-specific	See Table 2-31
Exposed skin surface area (cm2/event)	1980	7313	Hands and forearms of adult males; total surface area of young children (EPA, 1997)
Permeability coefficient (cm/hour)	Chemical-specific	Chemical-specific	See Table 3-11
Exposure time (hours/day)	1	1	Brief exposure during irrigation
Conversion factor (liter/cm3)	1.00E-03	1.00E-03	

Applicable AOCs

Ground water (Shallow)	Ground water (Deep)
GW AOC 1b	GW AOC 4

Table 3-10b
Summary of Exposure Parameters
Agricultural Use (CTE)
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter	Age		Basis
Common Parameters	**Adult**	**Young Child**	
Exposure Duration (years)	30	6	Upper bound residence time in EPA 1997
Body weight (kg)	71.8	16.6	Average male/female body weight for age group (EPA, 1997)
Carcinogenic averaging time (days)	27375	27375	EPA 1997 for lifetime
Noncancer averaging time (days)	10950	2190	Consistent with exposure duration
Cancer slope factor (1/(mg/kg-day))	Chemical-specific	Chemical-specific	See Table 4-1
Reference dose (mg/kg-day)	Chemical-specific	Chemical-specific	See Table 4-1
Inhalation of Vapor During Irrigation			
Exposure frequency (days/year)	12	12	1 day of irrigation per week for 3 months/year
Concentration in air (mg/m3)	Chemical-specific	Chemical-specific	See Appendix Tables B-65 through B-68
Inhalation rate (m3/hour)	1.5	1.2	EPA 1997 for individuals engaged in moderate activity outdoors
Exposure time (hours/day)	1	1	Brief exposure during irrigation
Dermal Contact with Ground water			
Concentration in water (mg/L)	Chemical-specific	Chemical-specific	See Table 2-31
Exposed skin surface area (cm2/event)	1980	7313	Hands and forearms of adult males; total surface area of young children (EPA, 1997)
Permeability coefficient (cm/hour)	Chemical-specific	Chemical-specific	See Table 3-11
Exposure time (hours/day)	1	1	Brief exposure during irrigation
Conversion factor (liter/cm3)	1.00E-03	1.00E-03	

Applicable AOCs

Ground water (Deep)

GW AOC 4

800250

Table 3-11
Summary of Chemical-Specific Oral and Dermal Absorption Values and Permeability Coefficients
BROS Human Health Risk Assessment
Bridgeport, NJ

Chemical of Potential Concern		Oral Absorption[a] (unitless)	Dermal Absorption[a] (unitless)	Permeability Coefficient[a] (cm/hr)
7429-90-5	Aluminum	0.1[b]	0.001[b]	0.00214[b]
7440-38-2	Arsenic	0.95	0.03	0.00193[b]
7440-39-3	Barium	0.07	0.001[b]	0.000403[b]
7440-41-7	Beryllium	0.007	0.001[b]	0.00066[b]
7440-47-3	Chromium	0.013	0.001[b]	0.001
7440-48-4	Cobalt	0.8[b]	0.001[b]	0.0004
7440-50-8	Copper	0.3[b]	0.001[b]	0.000307[b]
7439-89-6	Iron	0.15[b]	0.001[b]	0.000247[b]
7439-92-1	Lead	0.15[b]	0.001[b]	0.0001
7439-96-5	Manganese (nonfood)	0.04	0.001[b]	0.00128[b]
7439-97-6	Mercury (elemental)	0.8	0.001[b]	0.001
7440-02-0	Nickel	0.04	0.001[b]	0.0002
7782-49-2	Selenium	0.8	0.001[b]	0.000903[b]
7440-28-0	Thallium	1	0.001[b]	0.000157[b]
7440-62-2	Vanadium	0.026	0.001[b]	0.00135[b]
7440-66-6	Zinc	0.2[b]	0.001[b]	0.0006
91-57-6	2-Methylnapthalene	0.8[b]	0.1	0.142[b]
106-47-8	4-Chloroaniline	0.5[b]	0.1	0.00633[b]
59-50-7	4-Chloro-3-methylphenol	0.5	0.1	0.029[b]
105-67-9	2,4-Dimethylphenol	0.5[b]	0.1	0.011
99-09-2	3-Nitroaniline	0.8[b]	0.1	0.00257[b]
208-96-8	Acenaphthylene	0.89	0.13	0.141[b]
50-32-8	Benzo(a)pyrene	0.89	0.13	0.7
56-55-3	Benzo(a)anthracene	0.89	0.13	0.47
205-99-2	Benzo(b)fluoranthene	0.89	0.13	0.7
191-24-2	Benzo(g,h,i)perylene	0.89	0.13	2[b]
111-44-4	bis(2-Chloroethyl)ether	0.5[b]	0.1	0.0018
117-81-7	bis(2-Ethylhexyl)phthalate	0.19[b]	0.13	1.97[b]
53-70-3	Dibenzo(a,h)anthracene	0.89	0.13	1.5
193-39-5	Indeno(1,2,3-cd)pyrene	0.89	0.13	1
78-59-1	Isophorone	0.5[b]	0.1	0.0034
91-20-3	Naphthalene	0.89	0.13	0.047
98-95-3	Nitrobenzene	0.97[b]	c	0.00696[b]
85-01-8	Phenanthrene	0.89	0.13	0.14
71-55-6	1,1,1-Trichloroethane	0.9[b]	c	0.013
79-34-5	1,1,2,2-Tetrachloroethane	0.7[b]	c	0.0069
79-00-5	1,1,2-Trichloroethane	0.81[b]	c	0.00643[b]
75-34-3	1,1-Dichloroethane	1	c	0.0067
75-35-4	1,1-Dichloroethene	1	c	0.012
120-82-1	1,2,4-Trichlorobenzene	0.97[b]	c	0.066
95-50-1	1,2-Dichlorobenzene	0.8[b]	c	0.041
106-46-7	1,4-Dichlorobenzene	0.9[b]	c	0.042
107-06-2	1,2-Dichloroethane	1	c	0.0042
78-87-5	1,2-Dichloropropane	0.74[b]	c	0.0078
541-73-1	1,3-Dichlorobenzene	0.8[b]	c	0.058

Table 3-11
Summary of Chemical-Specific Oral and Dermal Absorption Values and Permeability Coefficients
BROS Human Health Risk Assessment
Bridgeport, NJ

Chemical of Potential Concern		Oral Absorption[a] (unitless)	Dermal Absorption[a] (unitless)	Permeability Coefficient[a] (cm/hr)
10061-01-5	Cis-1,3-dichloropropene	0.55[b]	c	0.0043
10061-02-6	Trans-1,3-dichloropropene	0.55[b]	c	0.0043
78-93-3	2-Butanone (methyl ethyl ketone)	0.8[b]	c	0.00096
591-78-6	2-Hexanone	0.66[b]	c	0.00445[b]
108-10-1	4-Methyl-2-pentanone (methyl isobutyl ketone)	0.8[b]	c	0.00397[b]
67-64-1	Acetone	0.83[b]	c	0.000569[b]
71-43-2	Benzene	0.97[b]	c	0.015
75-27-4	Bromodichloromethane	0.98[b]	c	0.0046
75-25-2	Bromoform	0.6[b]	c	0.00277[b]
75-15-0	Carbon disulfide	0.63[b]	c	0.017
56-23-5	Carbon tetrachloride	0.65[b]	c	0.016
108-90-7	Chlorobenzene	0.31[b]	c	0.028
75-00-3	Chloroethane	0.8[b]	c	0.0061
67-66-3	Chloroform	1[b]	c	0.0068
74-87-3	Chloromethane (methyl chloride)	0.8[b]	c	0.0033
156-59-2	cis-1,2-Dichloroethene	1	c	0.0149[b]
132-64-9	Dibenzofuran	0.8[b]	0.01[b]	0.151[b]
124-48-1	Dibromochloromethane	0.6[b]	c	0.00349[b]
100-41-4	Ethylbenzene	0.97[b]	c	0.049
75-09-2	Methylene chloride	0.95[b]	c	0.0035
100-42-5	Styrene	0.8[b]	c	0.037
127-18-4	Tetrachloroethene	1	c	0.033
108-88-3	Toluene	0.8[b]	c	0.031
156-60-5	trans-1,2-Dichloroethene	1	c	0.0077
79-01-6	Trichloroethene	1	c	0.012
75-01-4c	Vinyl chloride (inc early life)	1	c	0.0056
75-01-4a	Vinyl chloride (adult)	1	c	0.0056
1330-20-7	Xylenes (Total)	0.92[b]	c	0.0704[b]
1336-36-3	Total PCBs	1	0.14	0.922[b]

Notes:

a. Values are from EPA (2001). Risk Assessment Guidance for Superfund Volume I: Human Health. Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim, unless otherwise noted.

b. ORNL (2003) - Oak Ridge National Laboratory Toxicity and Chemical – Specific Factors Data Base.

c. No dermal absorption values are presented for volatile compounds. EPA (2001) does not consider dermal exposure to volatile organic compounds present in soil to be significant. The compounds tend to volatilize from soil and should be accounted for via the inhalation pathway.

800252

Table 3-12. Summary of Receptor Exposure Frequencies and Exposure Duration Estimates Used in the Johnson & Ettinger Vapor Flux Model[1,2]

Receptor	Frequency (days/year)		Duration (years)		Averaging Time (days) [noncancer]		Averaging Time (days) [cancer]	
	CTE	RME	CTE	RME	CTE	RME	CTE	RME
Commercial Worker	144	240	7	25	2555	9125	27375	27375

Note:

1. The parameter values from the Exposure Pathway Analysis Report for the BROS Superfund Site (Roux, 2002b) were modified to reflect current EPA recommendations. Adolescent trespasser assumptions for frequency and duration are best professional judgements.

Table 3-13. Future-Use Scenario for Commercial Worker - Summary of Key General Assumptions for the Johnson & Ettinger Vapor Flux Model for BROS Property and Adjoining Areas

	Variable	Value	Units	Comment
Building Characteristics [a]				
Type		On-slab	---	Assumed
Floor thickness	L_{crack}	15	cm	Default
Floor length	L_B	1524	cm	Assumed
Floor width	W_B	609.6	cm	Assumed
Room height	H_B	366	cm	Default
Floor-wall seam crack width	w	0.1	cm	Default
Exchange rate	ER	0.25	h^{-1}	Default
Depth below grade to floor	L_F	1	cm	Used as minimum value
Soil-bldg pressure differential	ΔP	40	$g/cm\text{-}s^2$	Default
Soil Characteristics				
Avg soil/groundwater temp	T_S	10	°C	Default
Stratum A Soil Type		S	(b)	Assumed all strata meet SCS requirements for sand.
Stratum A thickness	h_A	30.48	cm	
Stratum B Soil Type		S	(b)	
Stratum B thickness	h_B	15.24	cm	
Stratum C Soil Type		S	(b)	
Stratum C thickness	h_C	15.24	cm	

Notes:

(a) A 1,000 ft^2 (20-ft x 50-ft) industrial building was assumed for these calculations.
(b) Three soil strata were assumed, all meeting the characteristic of sand.
The soil characteristics of dry bulk density, water-filled porosity, and total porosity were the defaults in the model based on the soil type within each stratum.

Table 4-1. Summary of Chemical-Specific Toxicity Values

Chemical of Potential Concern	Oral CSF $(mg/kg\text{-}day)^{-1}$	Inhalation CSF $(mg/kg\text{-}day)^{-1}$	Oral RfD (mg/kg-day)	Inhalation RfD (mg/kg-day)
Aluminum	--	--	1.0E+00[a]	1.0E-03[a]
Arsenic	1.5E+00[b]	1.51E+01[b]	3.0E-04[b]	--
Beryllium	--	8.4E+00[b]	2.0E-03[b]	5.7E-06[b]
Barium	--	--	7.0E-02[b]	1.4E-04[e]
Chromium (III)	--	--	1.5E+00[b]	--
Chromium (VI)	--	4.1E+01[c]	3.0E-03[b]	3.0E-05[b]
Cobalt	--	9.8E+00[a]	2.0E-02[a]	5.7E-06[a]
Copper	--	--	4.0E-02[c]	--
Iron	--	--	3.0E-01[a]	--
Lead	NA	NA	NA	NA
Manganese (nonfood)	--	--	2.0E-02[b]	1.43E-05[b]
Mercury(elemental)	--	--	--	8.6E-05[b]
Nickel	--	--	2.0E-02[b]	--
Selenium	--	--	5.0E-03[b]	--
Thallium	--	--	7.0E-05[d]	--
Vanadium	--	--	1.0E-03[c]	--
Zinc	--	--	3.0E-01[b]	--
2-Methylnapthalene	--	--	2.0E-02[a]	--
4-Chloroaniline	5.4E-02[a]	--	4.0E-03[b]	--
4-Chloro-3-methylphenol	NA	NA	NA	NA
2,4-Dimethylphenol	--	--	2.0E-02[b]	--
3-Nitroaniline	2.0E-02[a]	--	3.0E-04[a]	3.0E-04[a]
Acenaphthylene	NA	NA	NA	NA
Benzo(a)pyrene	7.3E+00[b]	3.1E+00[a]	--	--
Benz(a)anthracene	7.3E-01[a]	--	--	--
Benzo(b)fluoranthene	7.3E-01[a]	--	--	--
Benzo(g,h,i)perylene	NA	NA	NA	NA
bis(2-Chloroethyl)ether	1.1E+00[b]	1.1E+00[b]	--	--
bis(2-Ethylhexyl)phthalate	1.4E-02[b]	1.4E-02[a]	2.0E-02[b]	--
Dibenz(a,h)anthracene	7.3E+00[a]	--	--	--
Indeno(1,2,3-cd)pyrene	7.3E-01[a]	--	--	--
Isophorone	9.5E-04[b]	--	2.0E-01[b]	--
Naphthalene	--	--	2.0E-02[b]	9.0E-04[b]
Phenanthrene	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	1.0E-02[b]	1.0E-03[a]
1,1,1-Trichloroethane	--	--	2.8E-01[a]	6.3E-01[a]
1,1,2,2-Tetrachloroethane	2.0E-01[b]	2.0E-01[b]	6.0E-02[a]	--
1,1,2-Trichloroethane	5.7E-02[b]	5.6E-02[b]	4.0E-03[b]	--
1,1-Dichloroethane	--	--	1.0E-01[c]	1.4E-01[e]
1,1-Dichloroethene	--	--	5.0E-02[b]	6.0E-02[b]
1,2-Dichlorobenzene	--	--	9.0E-02[b]	4.0E-02[c]
1,3-Dichlorobenzene	--	--	3.0E-02[a]	--
1,4-Dichlorobenzene	2.4E-02[c]	2.2E-02[a]	3.0E-02[a]	2.29E-01[b]
1,2-Dichloroethane	9.1E-02[b]	9.1E-02[b]	2.0E-02[a]	1.4E-03[a]
1,2-Dichloropropane	6.8E-02[c]	--	--	1.14E-03[b]
Cis-1-3-dichloropropene	NA	NA	NA	NA

Table 4-1. Summary of Chemical-Specific Toxicity Values

Chemical of Potential Concern	Oral CSF $(mg/kg\text{-}day)^{-1}$	Inhalation CSF $(mg/kg\text{-}day)^{-1}$	Oral RfD (mg/kg-day)	Inhalation RfD (mg/kg-day)
Trans-1-3-dichloropropene	NA	NA	NA	NA
Trans-1,2-dichloroethene	--	--	2.0E-02[b]	--
2-Butanone (methyl ethyl ketone)	--	--	6.0E-01[b]	1.43E+00[b]
2-Hexanone	--	--	4.0E-02[a]	1.4E-03[a]
4-Methyl-2-pentanone (methyl isobutyl ketone)	--	--	8.0E-02[f]	8.6E-01[b]
Acetone	--	--	9.0E-01[b]	--
Benzene	5.5E-02[b]	2.7E-02[b]	4.0E-03[b]	8.6E-03[b]
Bromodichloromethane	6.2E-02[b]	--	2.0E-02[b]	--
Bromoform	7.9E-3[b]	1.1E-6[b,g]	2.0E-2[b]	--
Carbon disulfide	--	--	1.0E-01[b]	2.0E-01[b]
Carbon tetrachloride	1.3E-1[b]	5.3E-02[b]	7.0E-4[b]	5.71E-04[a]
Chlorobenzene	--	--	2.0E-02[b]	1.7E-02[a]
Chloroethane	2.9E-03[a]	--	4.0E-01[a]	2.9E+00[b]
Chloroform	--	8.1E-02[b]	1.0E-02[b]	1.4E-02[a]
Chloromethane (methyl chloride)	--	--	--	2.6E-02[b]
cis-1,2-Dichloroethene	--	--	1.0E-02[c]	--
Dibenzofuran	--	--	2.0E-03[a]	--
Dibromochloromethane	8.4E-02[b]	--	2.0E-02[b]	--
Ethylbenzene	--	--	1.0E-01[b]	2.9E-01[b]
Methylene chloride	7.5E-03[b]	1.65E-03[b]	6.0E-02[b]	8.6E-01[c]
Nitrobenzene	--	--	5.0E-04[b]	6.0E-04[e]
Styrene	--	--	2.0E-01[b]	2.86E-01[b]
Tetrachloroethene	5.4E-01[d]	2.0E-02[d]	1.0E-02[b]	1.4E-01[a]
Toluene	--	--	2.0E-01[b]	1.14E-01[b]
Trichloroethene	4.0E-01[a]	4.0E-01[a]	3.0E-04[a]	1.0E-02[a]
Vinyl chloride (inc earlylife)	1.4E+00[b]	3.0E-02[b]	3.0E-03[b]	2.8E-02[b]
Vinyl chloride (adult)	7.2E-01[b]	1.5E-02[b]	3.0E-03[b]	2.8E-02[b]
Xylenes (Total)	--	--	2.0E-01[b]	3.0E-02[b]
PCBs (Total)	2.0E+00[b]	2.0E+00[b]	2.0E-05[b]	--

Notes:
a. EPA/NCEA provisional toxicity value.
b. EPA/IRIS toxicity value.
c. HEAST toxicity value.
d. Other, as specified by Region III risk-based concentration table (EPA, 2003).
e. HEAST alternate toxicity value, as specified by Region III risk-based concentration table (EPA, 2003).
f. Withdrawn from IRIS.
NA: Not available. An appropriate value was not provided by EPA

Table 4-2. Adjusted Oral Toxicity Criteria

Chemical of Potential Concern	Oral CSF (mg/kg-day)$^{-1}$	Oral RfD (mg/kg-day)
Aluminum	--	1.0E-01
Barium	--	4.9E-03
Beryllium	--	1.4E-05
Chromium (III)	--	1.95E-02
Chromium (VI)	--	7.5E-05
Copper	--	1.2E-02
Iron	--	4.5E-02
Lead		
Manganese (nonfood)	--	8.0E-04
Nickel	--	8.0E-04
Vanadium	--	2.6E-05
Zinc	--	6.0E-02
bis(2-Ethylhexyl)phthalate	7.4E-02	3.8E-03
Chlorobenzene	--	6.2E-03

Table 5-1
Summary of Potential Risks and Hazard Indices:
Trespasser (teen) RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Compound		Excess Lifetime Cancer Risk						Hazard Index					
		Surface Soil (ing/derm		Dust (surface soil)		Total-Soil		Surface Soil (ing/derm)		Dust (surface soil)		Total-Soil	
		AOC 1	AOC BP	AOC 1	AOC BP	**AOC 1**	**AOC BP**	AOC 1	AOC BP	AOC 1	AOC BP	**AOC 1**	**AOC BP**
7429-90-5	Aluminum	NC	NC	NC	NC	NC	NC	1E-04	2E-04	5E-04	7E-04	7E-04	9E-04
7440-38-2	Arsenic	8E-08	9E-08	6E-10	8E-10	8E-08	9E-08	2E-03	2E-03	1E-06	2E-06	2E-03	2E-03
7440-47-3	Chromium	NC	NC	NC	NC	NC	NC	2E-06	2E-06	1E-09	1E-09	2E-06	2E-06
7439-89-6	Iron	NC	NC	NC	NC	NC	NC	8E-04	1E-03	4E-06	4E-06	8E-04	1E-03
7439-96-5	Manganese	NC	NC	NC	NC	NC	NC	7E-04	8E-04	2E-03	2E-03	3E-03	3E-03
7439-97-6	Mercury	NC	NC	NC	NC	NC	NC	NC	NC	6E-08	8E-08	6E-08	8E-08
7439-92-1	Lead	NA	Request	NA	Request	NA	NC	NA	Request	NA	Request	NA	NC
7440-28-0	Thallium	NC	NC	NC	NC	NC	NC	6E-04	2E-03	1E-06	3E-06	6E-04	2E-03
7440-62-2	Vanadium	NA	NC	NA	NC	NC	NC	NA	3E-03	NA	3E-06	NA	3E-03
50-32-8	Benzo(a)pyrene	NA	9E-09	NA	1E-12	NC	9E-09	NA	NC	NA	NC	NA	NC
191-24-2	Benzo(g,h,i)perylene	Request	Request	Request	Request	NC	NC	Request	Request	Request	Request	NC	NC
85-01-8	Phenanthrene	Request	Request	Request	Request	NC	NC	Request	Request	Request	Request	NC	NC
1336-36-3	Total PCBs	NA	3E-08	NA	8E-12	NA	3E-08	NA	6E-03	NA	2E-06	NA	6E-03
						8E-08	**1E-07**					**6E-03**	**2E-02**

NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available
Request: Toxicity information has been requested from USEPA for chemical.

800258

Table 5-2
Summary of Potential Risks and Hazard Indices:
Groundskeeper (*RME*)
BROS Human Health Risk Assessment
Bridgeport, NJ

		Excess Lifetime Cancer Risk						Hazard Index					
		Surface Soil (ing/derm)		Dust (surface soil)		Total-Soil		Surface Soil (ing/derm)		Dust (surface soil)		Total-Soil	
	Compound	AOC 1	AOC BP	AOC 1	AOC BP	AOC 1	AOC BP	AOC 1	AOC BP	AOC 1	AOC BP	AOC 1	AOC BP
7429-90-5	Aluminum	NC	NC	NC	NC	NC	NC	1E-04	2E-04	9E-03	1E-02	9E-03	1E-02
7440-38-2	Arsenic	5E-07	5E-07	4E-08	4E-08	5E-07	6E-07	3E-03	4E-03	2E-05	3E-05	3E-03	4E-03
7440-47-3	Chromium	NC	NC	NC	NC	NC	NC	5E-07	7E-07	2E-08	3E-08	5E-07	7E-07
7439-89-6	Iron	NC	NC	NC	NC	NC	NC	1E-03	2E-03	6E-05	8E-05	1E-03	2E-03
191-24-2	Benzo(g,h,i)perylene	Request	Request	Request	Request	NC	NC	Request	Request	Request	Request	NC	NC
85-01-8	Phenanthrene	Request	Request	Request	Request	NC	NC	Request	Request	Request	Request	NC	NC
						5E-07	6E-07					1E-02	2E-02

NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available
Request: Toxicity information has been requested from USEPA for chemical.

800259

Table 5-3a
Summary of Potential Risks and Hazard Indices:
Construction Worker (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

		Excess Lifetime Cancer Risk																								
		Surface Soil (ing/derm)			Subsurface Soil (ing/derm)							Dust (subsurface soil)							Total-GW (derm)		Total-Soil						
	Compound	AOC 1	AOC 2	AOC BP	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC BP	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC BP	AOC 1a	AOC 1c	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC BP
71-55-6	1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
75-34-3	1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
120-82-1	1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
107-06-2	1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1E-10	NA	NA	NA	NA	NA	NA	NA	NA
78-87-5	1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5E-12	NA	NA	NA	NA	NA	NA	NA	NA
541-73-1	1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
106-46-7	1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4E-12	NA	NA	NA	NA	NA	NA	NA	NA
105-67-9	2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
78-93-3	2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
91-57-6	2-Methylnapthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
99-09-2	3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3E-13	NA	NA	NA	NA	NA	NA	NA	NA
59-50-7	4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Request	NA	NA	NA	NA	NA	NA	NA	NA
106-47-8	4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4E-10	NA	NA	NA	NA	NA	NA	NA	NA
108-10-1	4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
208-96-8	Acenaphthylene	NA	NA	NA	Request	Request	NA	NA	NA	NA	Request	Request	Request	NA	NA	NA	NA	Request	Request	NA	NC	NC	NA	NA	NA	NA	NC
67-64-1	Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
7429-90-5	Aluminum	NC	NA	NC	NC	NA	NA	NA	NA	NA	NC	NC	NA	NA	NA	NA	NA	NC	NC	NA	NC	NA	NA	NA	NA	NA	NC
7440-38-2	Arsenic	6E-08	4E-08	7E-08	4E-08	1E-08	5E-09	3E-09	4E-09	2E-09	1E-07	2E-08	6E-09	3E-09	2E-09	3E-09	1E-09	7E-08	1E-09	1E-10	1E-07	6E-08	9E-09	5E-09	7E-09	4E-09	3E-07
7440-39-3	Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
71-43-2	Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3E-09	NA	NA	NA	NA	NA	NA	NA	NA
56-55-3	Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1E-09	NA	NA	NA	NA	NA	NA	NA	NA
50-32-8	Benzo(a)pyrene	NA	2E-08	NA	NA	5E-09	NA	NA	NA	4E-09	2E-09	NA	8E-11	NA	NA	NA	6E-11	3E-11	2E-08	NA	NA	2E-08	NA	NA	NA	4E-09	2E-09
205-99-2	Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1E-09	NA	NA	NA	NA	NA	NA	NA	NA
191-24-2	Benzo(g,h,i)perylene	Request	Request	Request	Request	Request	Request	NA	NA	Request	Request	Request	Request	Request	NA	NA	Request	Request	Request	NA	NC	NC	NC	NA	NA	NC	NC
7440-41-7	Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
111-44-4	bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1E-08	NA	NA	NA	NA	NA	NA	NA	NA
117-81-7	bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4E-09	NA	NA	NA	NA	NA	NA	NA	NA
75-15-0	Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
108-90-7	Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
75-00-3	Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1E-12	NA	NA	NA	NA	NA	NA	NA	NA
67-66-3	Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
7440-47-3	Chromium	NC	NA	NC	NC	NA	NA	NA	NA	NA	NC	NC	NA	NA	NA	NA	NA	NC	NC	NA	NC	NA	NA	NA	NA	NA	NC
156-59-2	cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
7440-48-4	Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
7440-50-8	Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
132-64-9	Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
100-41-4	Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
193-39-5	Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2E-09	NA	NA	NA	NA	NA	NA	NA	NA
78-59-1	Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1E-12	NA	NA	NA	NA	NA	NA	NA	NA
7439-92-1	Lead	NA	NA	NA	Request	Request	NA	NA	NA	NA	Request	Request	Request	NA	NA	NA	NA	Request	Request	NA	NA	NC	NA	NA	NA	NA	NC
7439-97-6	Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
75-09-2	Methylene chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4E-12	NA	NA	NA	NA	NA	NA	NA	NA
91-20-3	Naphthalene	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NC	NA	NC	NA	NA	NA	NA	NA	NA
7440-02-0	Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
85-01-8	Phenanthrene	Request	Request	Request	Request	Request	Request	NA	NA	Request	Request	Request	Request	Request	NA	NA	Request	Request	Request	NA	NC	NC	NC	NA	NA	NC	NC
7782-49-2	Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
127-18-4	Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5E-10	NA	NA	NA	NA	NA	NA	NA	NA
7440-28-0	Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
108-88-3	Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
1336-36-3	Total PCBs	NA	8E-09	NA	5E-08	1E-08	NA	NA	NA	7E-08	4E-08	2E-09	4E-10	NA	NA	NA	2E-09	1E-09	2E-06	NA	5E-08	2E-08	NA	NA	NA	7E-08	4E-08
156-60-5	trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
79-01-6	Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1E-08	NA	NA	NA	NA	NA	NA	NA	NA
7440-62-2	Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
75-01-4a	Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4E-10	NA	NA	NA	NA	NA	NA	NA	NA
1330-20-7	Xylenes (Total)	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NC	NA	NC	NA	NA	NA	NA	NA	NA	NC	NA
7440-66-6	Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
																			2E-06	1E-10	2E-07	1E-07	9E-09	5E-09	7E-09	8E-08	3E-07

NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available
Request: Toxicity information has been requested from USEPA for chemical.

800260

Table 5-3a
Summary of Potential Risks and Hazard
Construction Worker (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

		Hazard Index																							
		Surface Soil (ing/derm)			Subsurface Soil (ing/derm)							Dust (subsurface soil)							Total-GW (derm)		Total-Soil					
	Compound	AOC 1	AOC 2	AOC BP	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC BP	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC BP	AOC 1a	AOC 1c	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC BP
71-55-6	1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5E-07	NA	NA	NA	NA	NA	NA	NA	NA
75-34-3	1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2E-06	NA	NA	NA	NA	NA	NA	NA	NA
120-82-1	1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8E-06	NA	NA	NA	NA	NA	NA	NA	NA
107-06-2	1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5E-06	NA	NA	NA	NA	NA	NA	NA	NA
78-87-5	1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
541-73-1	1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3E-07	NA	NA	NA	NA	NA	NA	NA	NA
106-46-7	1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4E-07	NA	NA	NA	NA	NA	NA	NA	NA
105-67-9	2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2E-05	NA	NA	NA	NA	NA	NA	NA	NA
78-93-3	2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9E-08	NA	NA	NA	NA	NA	NA	NA	NA
91-57-6	2-Methylnapthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6E-05	NA	NA	NA	NA	NA	NA	NA	NA
99-09-2	3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4E-06	NA	NA	NA	NA	NA	NA	NA	NA
59-50-7	4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Request	NA	NA	NA	NA	NA	NA	NA	NA
106-47-8	4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1E-04	NA	NA	NA	NA	NA	NA	NA	NA
108-10-1	4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3E-06	NA	NA	NA	NA	NA	NA	NA	NA
208-96-8	Acenaphthylene	NA	NA	NA	Request	Request	NA	NA	NA	NA	Request	Request	Request	NA	NA	NA	NA	Request	Request	NA	NA	NC	NA	NA	NA	NA	NC
67-64-1	Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4E-07	NA	NA	NA	NA	NA	NA	NA	NA
7429-90-5	Aluminum	6E-04	NA	7E-04	2E-04	NA	NA	NA	NA	NA	1E-04	7E-02	NA	NA	NA	NA	NA	5E-02	3E-03	NA	7E-02	NA	NA	NA	NA	NA	5E-02
7440-38-2	Arsenic	9E-03	7E-03	1E-02	6E-03	2E-03	9E-04	5E-04	7E-04	4E-04	2E-02	4E-04	1E-04	5E-05	3E-05	4E-05	2E-05	1E-03	2E-04	2E-05	2E-02	9E-03	1E-03	6E-04	8E-04	4E-04	3E-02
7440-39-3	Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7E-06	NA	NA	NA	NA	NA	NA	NA	NA
71-43-2	Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1E-03	NA	NA	NA	NA	NA	NA	NA	NA
56-55-3	Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
50-32-8	Benzo(a)pyrene	NA	NC	NA	NA	NC	NA	NA	NA	NC	NC	NA	NC	NA	NA	NA	NC	NC	NC	NA	NA	NC	NA	NA	NA	NC	NC
205-99-2	Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
191-24-2	Benzo(g,h,i)perylene	Request	Request	Request	Request	Request	Request	NA	NA	Request	Request	Request	Request	Request	NA	NA	Request	Request	Request	NA	NC	NC	NC	NA	NA	NC	NC
7440-41-7	Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3E-04	NA	NA	NA	NA	NA	NA	NA	NA
111-44-4	bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
117-81-7	bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1E-03	NA	NA	NA	NA	NA	NA	NA	NA
75-15-0	Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2E-06	NA	NA	NA	NA	NA	NA	NA	NA
108-90-7	Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3E-05	NA	NA	NA	NA	NA	NA	NA	NA
75-00-3	Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7E-08	NA	NA	NA	NA	NA	NA	NA	NA
67-66-3	Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2E-06	NA	NA	NA	NA	NA	NA	NA	NA
7440-47-3	Chromium	4E-06	NA	5E-06	4E-06	NA	NA	NA	NA	NA	2E-06	5E-07	NA	NA	NA	NA	NA	2E-07	2E-05	NA	9E-06	NA	NA	NA	NA	NA	8E-06
156-59-2	cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3E-03	NA	NA	NA	NA	NA	NA	NA	NA
7440-48-4	Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8E-07	NA	NA	NA	NA	NA	NA	NA	NA
7440-50-8	Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5E-07	NA	NA	NA	NA	NA	NA	NA	NA
132-64-9	Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2E-05	NA	NA	NA	NA	NA	NA	NA	NA
100-41-4	Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	2E-05	NA	NA	NA	NA	NA	NA	5E-07	NA	5E-05	NA	NA	NA	NA	NA	NA	2E-05	NA
193-39-5	Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
78-59-1	Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6E-07	NA	NA	NA	NA	NA	NA	NA	NA
7439-92-1	Lead	NA	NA	NA	Request	Request	NA	NA	NA	NA	Request	Request	Request	NA	NA	NA	NA	Request	Request	NA	NA	NC	NA	NA	NA	NA	NC
7439-97-6	Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA	NA
75-09-2	Methylene chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7E-07	NA	NA	NA	NA	NA	NA	NA	NA
91-20-3	Naphthalene	NA	NA	NA	1E-04	NA	NA	NA	NA	NA	NA	1E-04	NA	NA	NA	NA	NA	NA	9E-05	NA	3E-04	NA	NA	NA	NA	NA	NA
7440-02-0	Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2E-04	NA	NA	NA	NA	NA	NA	NA	NA
85-01-8	Phenanthrene	Request	Request	Request	Request	Request	Request	NA	NA	Request	Request	Request	Request	Request	NA	NA	Request	Request	Request	NA	NC	NC	NC	NA	NA	NC	NC
7782-49-2	Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3E-06	NA	NA	NA	NA	NA	NA	NA	NA
127-18-4	Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8E-06	NA	NA	NA	NA	NA	NA	NA	NA
7440-28-0	Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7E-05	NA	NA	NA	NA	NA	NA	NA	NA
108-88-3	Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1E-04	NA	NA	NA	NA	NA	NA	NA	NA
1336-36-3	Total PCBs	NA	1E-02	NA	9E-02	2E-02	NA	NA	NA	1E-01	8E-02	3E-03	8E-04	NA	NA	NA	4E-03	3E-03	4E+00	NA	9E-02	4E-02	NA	NA	NA	1E-01	8E-02
156-60-5	trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6E-07	NA	NA	NA	NA	NA	NA	NA	NA
79-01-6	Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7E-03	NA	NA	NA	NA	NA	NA	NA	NA
7440-62-2	Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4E-02	NA	NA	NA	NA	NA	NA	NA	NA
75-01-4a	Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1E-05	NA	NA	NA	NA	NA	NA	NA	NA
1330-20-7	Xylenes (Total)	NA	NA	NA	NA	NA	NA	NA	NA	3E-05	NA	NA	NA	NA	NA	NA	1E-05	NA	3E-04	NA	NA	NA	NA	NA	NA	4E-05	NA
7440-66-6	Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5E-06	NA	NA	NA	NA	NA	NA	NA	NA
																			4E+00	2E-05	2E-01	5E-02	1E-03	6E-04	8E-04	1E-01	2E-01

NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available
Request: Toxicity information has been requested from USEPA for chemical.

800261

Table 5-3b
Summary of Potential Risks and Hazard Indices:
Construction Worker (CTE)
BROS Human Health Risk Assessment
Bridgeport, NJ

		Total-GW (dermal)	
		Excess Lifetime Cancer Risk	Hazard Index
	Compound	AOC 1a	AOC 1a
71-55-6	1,1,1-Trichloroethane	NC	2E-07
75-34-3	1,1-Dichloroethane	NC	9E-07
120-82-1	1,2,4-Trichlorobenzene	NC	4E-06
107-06-2	1,2-Dichloroethane	3E-11	2E-06
78-87-5	1,2-Dichloropropane	1E-12	NC
541-73-1	1,3-Dichlorobenzene	NC	2E-07
106-46-7	1,4-Dichlorobenzene	8E-13	2E-07
105-67-9	2,4-Dimethylphenol	NC	1E-05
78-93-3	2-Butanone	NC	4E-08
91-57-6	2-Methylnapthalene	NC	3E-05
99-09-2	3-Nitroaniline	7E-14	2E-06
59-50-7	4-Chloro-3-methylphenol	Request	Request
106-47-8	4-Chloroaniline	9E-11	6E-05
108-10-1	4-Methyl-2-pentanone	NC	2E-06
208-96-8	Acenaphthylene	Request	Request
67-64-1	Acetone	NC	2E-07
7429-90-5	Aluminum	NC	2E-03
7440-38-2	Arsenic	2E-10	8E-05
7440-39-3	Barium	NC	3E-06
71-43-2	Benzene	7E-10	5E-04
56-55-3	Benzo(a)anthracene	3E-10	NC
50-32-8	Benzo(a)pyrene	4E-09	NC
205-99-2	Benzo(b)fluoranthene	3E-10	NC
191-24-2	Benzo(g,h,i)perylene	Request	Request
7440-41-7	Beryllium	NC	1E-04
111-44-4	bis(2-Chloroethyl)ether	3E-09	NC
117-81-7	bis(2-Ethylhexyl)phthalate	1E-09	5E-04
75-15-0	Carbon disulfide	NC	7E-07
108-90-7	Chlorobenzene	NC	1E-05
75-00-3	Chloroethane	2E-13	3E-08
67-66-3	Chloroform	NC	1E-06
7440-47-3	Chromium	NC	8E-06
156-59-2	cis-1,2-Dichloroethene	NC	1E-03
7440-48-4	Cobalt	NC	4E-07
7440-50-8	Copper	NC	2E-07
132-64-9	Dibenzofuran	NC	9E-06
100-41-4	Ethylbenzene	NC	2E-05
193-39-5	Indeno(1,2,3-cd)pyrene	4E-10	NC
78-59-1	Isophorone	3E-13	3E-07
7439-92-1	Lead	Request	Request

800262

Table 5-3b
Summary of Potential Risks and Hazard Indices:
Construction Worker (CTE)
BROS Human Health Risk Assessment
Bridgeport, NJ

Compound		Total-GW (dermal)	
		Excess Lifetime Cancer Risk	Hazard Index
		AOC 1a	AOC 1a
7439-97-6	Mercury	NC	NC
75-09-2	Methylene chloride	1E-12	3E-07
91-20-3	Naphthalene	NC	4E-05
7440-02-0	Nickel	NC	7E-05
85-01-8	Phenanthrene	Request	Request
7782-49-2	Selenium	NC	1E-06
127-18-4	Tetrachloroethene	1E-10	3E-06
7440-28-0	Thallium	NC	3E-05
108-88-3	Toluene	NC	5E-05
1336-36-3	Total PCBs	4E-07	2E+00
156-60-5	trans-1,2-Dichloroethene	NC	3E-07
79-01-6	Trichloroethene	3E-09	3E-03
7440-62-2	Vanadium	NC	2E-02
75-01-4a	Vinyl chloride	8E-11	6E-06
1330-20-7	Xylenes (Total)	NC	1E-04
7440-66-6	Zinc	NC	2E-06
		5E-07	2E+00

NA: Not a COPC in AOC or medium

NC: HI and/or Risk not calculated, tox info either does not exist or is not available

Table 5-4
Summary of Potential Risks and Hazard Indices:
Utility Worker (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

		Excess Lifetime Cancer Risk																						
		Surface Soil (ing/derm)			Subsurface Soil (ing/derm)							Dust (subsurface soil)							Total-Soil						
	Compound	AOC 1	AOC 2	AOC BP	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC BP	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC BP	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC BP
7429-90-5	Aluminum	NC	NA	NC	NC	NA	NA	NA	NA	NA	NC	NC	NA	NA	NA	NA	NA	NC	NC	NA	NA	NA	NA	NA	NC
7440-38-2	Arsenic	5E-09	4E-09	6E-09	1E-08	4E-09	2E-09	1E-09	2E-09	8E-10	4E-08	6E-10	2E-10	9E-11	5E-11	7E-11	4E-11	2E-09	2E-08	7E-09	2E-09	1E-09	2E-09	8E-10	5E-08
7440-47-3	Chromium	NC	NA	NC	NC	NA	NA	NA	NA	NA	NC	NC	NA	NA	NA	NA	NA	NC	NC	NA	NA	NA	NA	NA	NC
7439-89-6	Iron	NC	NC	NC	NC	NC	NA	NA	NA	NA	NC	NC	NC	NA	NA	NA	NA	NC	NC	NC	NA	NA	NA	NA	NC
7439-92-1	Lead	NA	NA	NA	Request	Request	NA	NA	NA	NA	Request	Request	Request	NA	NA	NA	NA	Request	NC	NC	NA	NA	NA	NA	NC
208-96-8	Acenaphthylene	NA	NA	NA	Request	Request	NA	NA	NA	NA	Request	Request	Request	NA	NA	NA	NA	Request	NC	NC	NA	NA	NA	NA	NC
50-32-8	Benzo(a)pyrene	NA	2E-09	NA	NA	2E-09	NA	NA	NA	2E-09	1E-09	NA	2E-12	NA	NA	NA	2E-12	8E-13	NA	5E-09	NA	NA	NA	2E-09	1E-09
191-24-2	Benzo(g,h,i)perylene	Request	Request	Request	Request	Request	Request	NA	NA	Request	Request	Request	Request	Request	NA	NA	Request	Request	NC	NC	NC	NA	NA	NC	NC
91-20-3	Naphthalene	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA
85-01-8	Phenanthrene	Request	Request	Request	Request	Request	Request	NA	NA	Request	Request	Request	Request	Request	NA	NA	Request	Request	NC	NC	NC	NA	NA	NC	NC
100-41-4	Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NC	NA
1330-20-7	Xylenes (Total)	NA	NA	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NC	NA	NA	NA	NA	NA	NA	NC	NA
1336-36-3	Total PCBs	NA	1E-09	NA	2E-08	7E-09	NA	NA	NA	3E-08	2E-08	4E-11	1E-11	NA	NA	NA	6E-11	4E-11	2E-08	8E-09	NA	NA	NA	3E-08	2E-08
																			4E-08	2E-08	2E-09	1E-09	2E-09	4E-08	7E-08

NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

800264

Table 5-4
Summary of Potential Risks and Hazard Indices:
Utility Worker (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

		Hazard Index																						
		Surface Soil (ing/derm)			Subsurface Soil (ing/derm)							Dust (subsurface soil)							Total-Soil						
	Compound	AOC 1	AOC 2	AOC BP	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC BP	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC BP	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC BP
7429-90-5	Aluminum	7E-05	NA	9E-05	8E-05	NA	NA	NA	NA	NA	5E-05	2E-03	NA	NA	NA	NA	NA	1E-03	2E-03	NA	NA	NA	NA	NA	1E-03
7440-38-2	Arsenic	8E-04	6E-04	1E-03	2E-03	6E-04	3E-04	2E-04	3E-04	1E-04	7E-03	1E-05	3E-06	2E-06	9E-07	1E-06	6E-07	3E-05	3E-03	1E-03	3E-04	2E-04	3E-04	1E-04	8E-03
7440-47-3	Chromium	7E-07	NA	1E-06	3E-06	NA	NA	NA	NA	NA	2E-06	1E-08	NA	NA	NA	NA	NA	7E-09	4E-06	NA	NA	NA	NA	NA	3E-06
7439-89-6	Iron	4E-04	3E-04	5E-04	6E-04	3E-04	NA	NA	NA	NA	5E-04	1E-05	7E-06	NA	NA	NA	NA	1E-05	1E-03	5E-04	NA	NA	NA	NA	1E-03
7439-92-1	Lead	NA	NA	NA	Request	Request	NA	NA	NA	NA	Request	Request	Request	NA	NA	NA	NA	Request	NC	NC	NA	NA	NA	NA	NC
208-96-8	Acenaphthylene	NA	NA	NA	Request	Request	NA	NA	NA	NA	Request	Request	Request	NA	NA	NA	NA	Request	NC	NC	NA	NA	NA	NA	NC
50-32-8	Benzo(a)pyrene	NA	NC	NA	NA	NC	NA	NA	NA	NC	NC	NA	NC	NA	NA	NA	NC	NC	NA	NC	NA	NA	NA	NC	NC
191-24-2	Benzo(g,h,i)perylene	Request	Request	Request	Request	Request	Request	NA	NA	Request	Request	Request	Request	Request	NA	NA	Request	Request	NC	NC	NC	NA	NA	NC	NC
91-20-3	Naphthalene	NA	NA	NA	7E-05	NA	NA	NA	NA	NA	NA	3E-06	NA	NA	NA	NA	NA	NA	7E-05	NA	NA	NA	NA	NA	NA
85-01-8	Phenanthrene	Request	Request	Request	Request	Request	Request	NA	NA	Request	Request	Request	Request	Request	NA	NA	Request	Request	NC	NC	NC	NA	NA	NC	NC
100-41-4	Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	5E-06	NA	NA	NA	NA	NA	NA	1E-08	NA	NA	NA	NA	NA	NA	5E-06	NA
1330-20-7	Xylenes (Total)	NA	NA	NA	NA	NA	NA	NA	NA	6E-06	NA	NA	NA	NA	NA	NA	4E-07	NA	NA	NA	NA	NA	NA	7E-06	NA
1336-36-3	Total PCBs	NA	2E-03	NA	4E-02	1E-02	NA	NA	NA	6E-02	4E-02	8E-05	2E-05	NA	NA	NA	1E-04	7E-05	4E-02	1E-02	NA	NA	NA	7E-02	4E-02
																			5E-02	2E-02	3E-04	2E-04	3E-04	7E-02	5E-02

NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

800265

Table 5-5
Summary of Potential Risks and Hazard Indices:
Residential (Adult) (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Compound		Excess Lifetime Cancer Risk						Hazard Index					
		GW (ing and inh/derm (shower))						GW (ing and inh/derm (shower))					
		AOC 1b		AOC 4		Total		AOC 1b		AOC 4		Total	
		Ing	inh/derm Shower	Ing	inh/derm Shower	AOC 1b	AOC 4	Ing	inh/derm Shower	Ing	inh/derm Shower	AOC 1b	AOC 4
7429-90-5	Aluminum	NC	NC	NA	NA	NC	NA	3E-03	4E-03	NA	NA	7E-03	NA
7440-38-2	Arsenic	NA	NA	1E-04	4E-07	NA	1E-04	NA	NA	7E-01	1E-02	NC	7E-01
7440-28-0	Thallium	NC	NC	NA	NA	NC	NA	6E+00	6E-03	NA	NA	6E+00	NA
111-44-4	bis(2-Chloroethyl)ether	NA	NA	3E-03	2E-03	NA	5E-03	NA	NA	NC	NC	NA	NC
79-34-5	1,1,2,2-Tetrachloroethane	NA	NA	1E-05	9E-06	NA	2E-05	NA	NA	4E-03	3E-03	NA	7E-03
79-00-5	1,1,2-Trichloroethane	NA	NA	1E-06	9E-07	NA	2E-06	NA	NA	2E-02	2E-02	NA	3E-02
75-35-4	1,1-Dichloroethene	NA	NA	NC	NC	NA	NC	NA	NA	1E-03	1E-03	NA	2E-03
107-06-2	1,2-Dichloroethane	NA	NA	3E-05	2E-05	NA	5E-05	NA	NA	5E-02	4E-01	NA	5E-01
71-43-2	Benzene	NA	NA	2E-05	1E-05	NA	4E-05	NA	NA	3E-01	3E-01	NA	7E-01
67-66-3	Chloroform	NA	NA	NC	NC	NA	NC	NA	NA	5E-02	3E-02	NA	7E-02
156-59-2	cis-1,2-Dichloroethene	NA	NA	NC	NC	NA	NC	NA	NA	2E-01	3E-01	NA	5E-01
127-18-4	Tetrachloroethene	NA	NA	5E-06	1E-06	NA	6E-06	NA	NA	3E-03	3E-03	NA	6E-03
79-01-6	Trichloroethene	NA	NA	2E-04	1E-04	NA	3E-04	NA	NA	4E+00	8E-01	NA	5E+00
75-01-4	Vinyl chloride	NA	NA	1E-04	1E-04	NA	2E-04	NA	NA	2E-01	3E-01	NA	5E-01
						NA	6E-03					6E+00	8E+00

NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

800266

Table 5-6
Summary of Potential Risks and Hazard Indices:
Residential (0-5 Child) (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Compound		Excess Lifetime Cancer Risk						Hazard Index					
		GW (ing and inh/derm (shower))						GW (ing and inh/derm (shower))					
		AOC 1b		AOC 4		Total		AOC 1b		AOC 4		Total	
		Ing	inh/derm Shower	Ing	inh/derm Shower	AOC 1b	AOC 4	Ing	inh/derm Shower	Ing	inh/derm Shower	AOC 1b	AOC 4
7429-90-5	Aluminum	NC	NC	NA	NA	NC	NA	9E-03	5E-03	NA	NA	1E-02	NA
7440-38-2	Arsenic	NA	NA	8E-05	5E-06	NA	9E-05	NA	NA	2E+00	1E-02	NA	2E+00
7440-28-0	Thallium	NC	NC	NA	NA	NC	NA	2E+01	7E-03	NA	NA	2E+01	NA
111-44-4	bis(2-Chloroethyl)ether	NA	NA	2E-03	2E-02	NA	2E-02	NA	NA	NC	NC	NA	NC
79-34-5	1,1,2,2-Tetrachloroethane	NA	NA	1E-05	1E-05	NA	3E-05	NA	NA	1E-02	3E-03	NA	1E-02
79-00-5	1,1,2-Trichloroethane	NA	NA	9E-07	1E-06	NA	2E-06	NA	NA	5E-02	2E-02	NA	7E-02
75-35-4	1,1-Dichloroethene	NA	NA	NC	NC	NA	NC	NA	NA	4E-03	9E-04	NA	5E-03
107-06-2	1,2-Dichloroethane	NA	NA	2E-05	6E-06	NA	3E-05	NA	NA	2E-01	4E-01	NA	6E-01
71-43-2	Benzene	NA	NA	2E-05	4E-05	NA	5E-05	NA	NA	1E+00	3E-01	NA	1E+00
67-66-3	Chloroform	NA	NA	NC	NC	NA	NC	NA	NA	2E-01	3E-02	NA	2E-01
156-59-2	cis-1,2-Dichloroethene	NA	NA	NC	NC	NA	NC	NA	NA	6E-01	2E-01	NA	8E-01
127-18-4	Tetrachloroethene	NA	NA	4E-06	1E-05	NA	2E-05	NA	NA	9E-03	2E-03	NA	1E-02
79-01-6	Trichloroethene	NA	NA	1E-04	8E-05	NA	2E-04	NA	NA	1E+01	6E-01	NA	1E+01
75-01-4	Vinyl chloride	NA	NA	2E-04	8E-04	NA	1E-03	NA	NA	6E-01	2E-01	NA	8E-01
						NA	2E-02					2E+01	2E+01

NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

800267

Table 5-7a
Summary of Potential Risks and Hazard Indices:
Residential (Adult + Child) (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Compound		Excess Lifetime Cancer Risk						Hazard Index					
		GW (ing and inh/derm (shower))						GW (ing and inh/derm (shower))					
		AOC 1b		AOC 4		Total		AOC 1b		AOC 4		Total	
		Ing	inh/derm Shower	Ing	inh/derm Shower	AOC 1b	AOC 4	Ing	inh/derm Shower	Ing	inh/derm Shower	AOC 1b	AOC 4
7429-90-5	Aluminum	NC	NC	NA	NA	NC	NA	4E-03	4E-03	NA	NA	8E-03	NA
7440-38-2	Arsenic	NA	NA	2E-04	6E-06	NA	2E-04	NA	NA	1E+00	1E-02	NA	1E+00
7440-28-0	Thallium	NC	NC	NA	NA	NC	NA	8E+00	7E-03	NA	NA	8E+00	NA
111-44-4	bis(2-Chloroethyl)ether	NA	NA	5E-03	2E-02	NA	3E-02	NA	NA	NC	NC	NA	NC
79-34-5	1,1,2,2-Tetrachloroethane	NA	NA	3E-05	2E-05	NA	5E-05	NA	NA	5E-03	3E-03	NA	9E-03
79-00-5	1,1,2-Trichloroethane	NA	NA	2E-06	2E-06	NA	4E-06	NA	NA	2E-02	2E-02	NA	4E-02
75-35-4	1,1-Dichloroethene	NA	NA	NC	NC	NA	NC	NA	NA	2E-03	1E-03	NA	3E-03
107-06-2	1,2-Dichloroethane	NA	NA	5E-05	2E-05	NA	8E-05	NA	NA	7E-02	4E-01	NA	5E-01
71-43-2	Benzene	NA	NA	4E-05	5E-05	NA	9E-05	NA	NA	5E-01	3E-01	NA	8E-01
67-66-3	Chloroform	NA	NA	NC	NC	NA	NC	NA	NA	7E-02	3E-02	NA	9E-02
156-59-2	cis-1,2-Dichloroethene	NA	NA	NC	NC	NA	NC	NA	NA	3E-01	3E-01	NA	5E-01
127-18-4	Tetrachloroethene	NA	NA	8E-06	1E-05	NA	2E-05	NA	NA	4E-03	3E-03	NA	7E-03
79-01-6	Trichloroethene	NA	NA	3E-04	2E-04	NA	5E-04	NA	NA	6E+00	7E-01	NA	6E+00
75-01-4	Vinyl chloride	NA	NA	3E-04	9E-04	NA	1E-03	NA	NA	3E-01	3E-01	NA	5E-01
						NA	3E-02					9E+00	1E+01

Total Hazard Indices are a weighted sum of adult and child (i.e. (Adult * 24y + Child * 6y) / 30y
Cancer Risks are a sum of adult and child (i.e. Adult + Child)
NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

800268

Table 5-7b
Summary of Potential Risks and Hazard Indices:
Residential (Adult + Child) (CTE)
BROS Human Health Risk Assessment
Bridgeport, NJ

		GW (ingestion)			
		Excess Lifetime Cancer Risk		Hazard Index	
Compound		AOC 1b	AOC 4	AOC 1b	AOC 4
7429-90-5	Aluminum	NC	NA	2E-03	NA
7440-38-2	Arsenic	NA	1E-04	NA	6E-01
7440-28-0	Thallium	NC	NA	5E+00	NA
111-44-4	bis(2-Chloroethyl)ether	NA	3E-03	NA	NC
79-34-5	1,1,2,2-Tetrachloroethane	NA	1E-05	NA	3E-03
79-00-5	1,1,2-Trichloroethane	NA	1E-06	NA	1E-02
75-35-4	1,1-Dichloroethene	NA	NC	NA	1E-03
107-06-2	1,2-Dichloroethane	NA	3E-05	NA	4E-02
71-43-2	Benzene	NA	2E-05	NA	3E-01
67-66-3	Chloroform	NA	NC	NA	4E-02
156-59-2	cis-1,2-Dichloroethene	NA	NC	NA	1E-01
127-18-4	Tetrachloroethene	NA	5E-06	NA	2E-03
79-01-6	Trichloroethene	NA	2E-04	NA	3E+00
75-01-4	Vinyl chloride	NA	2E-04	NA	2E-01
		NA	3E-03	5E+00	5E+00

Total Hazard Indices are a weighted sum of adult and child (i.e. (Adult * 24y + Child * 6y) / 30y
Cancer Risks are a sum of adult and child (i.e. Adult + Child)
NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

Note: A CTE evaluation was not performed for the shower scenario, as no CTE exposure parameters could be defined.

Table 5-8
Summary of Potential Risks and Hazard Indices:
Agricultural (Adult) (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

Compound		Excess Lifetime Cancer Risk						Hazard Index					
		GW-derm		GW-inh.irrigation		**Total-GW**		GW-derm		GW-inh.irrigation		**Total-GW**	
		AOC 1b	AOC 4	AOC 1b	AOC 4	AOC 1b	AOC 4	AOC 1b	AOC 4	AOC 1b	AOC 4	AOC 1b	AOC 4
7429-90-5	Aluminum	NC	NA	NA	NA	NC	NA	2E-05	NA	NA	NA	2E-05	NA
7440-38-2	Arsenic	NA	8E-09	NA	NA	NA	8E-09	NA	4E-05	NA	NA	NA	4E-05
7440-28-0	Thallium	NC	NA	NA	NA	NC	NA	3E-05	NA	NA	NA	3E-05	NA
111-44-4	bis(2-Chloroethyl)ether	NA	3E-07	NA	NA	NA	3E-07	NA	NC	NA	NA	NA	NC
79-34-5	1,1,2,2-Tetrachloroethane	NA	5E-09	NA	1E-08	NA	2E-08	NA	1E-06	NA	2E-06	NA	3E-06
79-00-5	1,1,2-Trichloroethane	NA	3E-10	NA	8E-10	NA	1E-09	NA	4E-06	NA	8E-06	NA	1E-05
75-35-4	1,1-Dichloroethene	NA	NC	NA	NC	NA	NC	NA	4E-07	NA	5E-07	NA	9E-07
107-06-2	1,2-Dichloroethane	NA	4E-09	NA	2E-08	NA	2E-08	NA	6E-06	NA	3E-04	NA	3E-04
71-43-2	Benzene	NA	1E-08	NA	6E-09	NA	2E-08	NA	1E-04	NA	7E-05	NA	2E-04
67-66-3	Chloroform	NA	NC	NA	7E-09	NA	7E-09	NA	9E-06	NA	1E-05	NA	2E-05
156-59-2	cis-1,2-Dichloroethene	NA	NC	NA	NC	NA	NC	NA	8E-05	NA	8E-05	NA	2E-04
127-18-4	Tetrachloroethene	NA	6E-09	NA	9E-11	NA	6E-09	NA	3E-06	NA	8E-08	NA	3E-06
79-01-6	Trichloroethene	NA	7E-08	NA	8E-08	NA	2E-07	NA	1E-03	NA	5E-05	NA	1E-03
75-01-4a	Vinyl chloride	NA	3E-08	NA	1E-09	NA	3E-08	NA	3E-05	NA	9E-06	NA	4E-05
						NC	**6E-07**					**4E-05**	**2E-03**

NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

Table 5-9a
Summary of Potential Risks and Hazard Indices:
Agricultural (Child) (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

		Excess Lifetime Cancer Risk						Hazard Index					
		GW-derm		GW-inh.irr.		Total-GW		GW-derm		GW-inh.irr.		Total-GW	
Compound		AOC 1b	AOC 4	AOC 1b	AOC 4	AOC 1b	AOC 4	AOC 1b	AOC 4	AOC 1b	AOC 4	AOC 1b	AOC 4
7429-90-5	Aluminum	NC	NA	NA	NA	NC	NA	3E-04	NA	NA	NA	3E-04	NA
7440-38-2	Arsenic	NA	2E-08	NA	NA	NA	2E-08	NA	7E-04	NA	NA	NA	7E-04
7440-28-0	Thallium	NC	NA	NA	NA	NC	NA	4E-04	NA	NA	NA	4E-04	NA
111-44-4	bis(2-Chloroethyl)ether	NA	1E-06	NA	NA	NA	1E-06	NA	NC	NA	NA	NA	NC
79-34-5	1,1,2,2-Tetrachloroethane	NA	2E-08	NA	8E-09	NA	2E-08	NA	2E-05	NA	8E-06	NA	2E-05
79-00-5	1,1,2-Trichloroethane	NA	1E-09	NA	5E-10	NA	2E-09	NA	6E-05	NA	3E-05	NA	9E-05
75-35-4	1,1-Dichloroethene	NA	NC	NA	NC	NA	NC	NA	7E-06	NA	2E-06	NA	9E-06
107-06-2	1,2-Dichloroethane	NA	1E-08	NA	1E-08	NA	3E-08	NA	1E-04	NA	1E-03	NA	1E-03
71-43-2	Benzene	NA	4E-08	NA	4E-09	NA	5E-08	NA	2E-03	NA	2E-04	NA	3E-03
67-66-3	Chloroform	NA	NC	NA	5E-09	NA	5E-09	NA	1E-04	NA	5E-05	NA	2E-04
156-59-2	cis-1,2-Dichloroethene	NA	NC	NA	NC	NA	NC	NA	1E-03	NA	3E-04	NA	1E-03
127-18-4	Tetrachloroethene	NA	2E-08	NA	7E-11	NA	2E-08	NA	4E-05	NA	3E-07	NA	4E-05
79-01-6	Trichloroethene	NA	2E-07	NA	6E-08	NA	3E-07	NA	2E-02	NA	2E-04	NA	2E-02
75-01-4a	Vinyl chloride	NA	2E-07	NA	2E-09	NA	2E-07	NA	5E-04	NA	3E-05	NA	5E-04
						NC	2E-06					7E-04	3E-02

NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

Table 5-9b
Summary of Potential Risks and Hazard Indices:
Agricultural (Child) (CTE)
BROS Human Health Risk Assessment
Bridgeport, NJ

Compound		GW-dermal	
		Excess Lifetime Cancer Risk	Hazard Index
		AOC 4	AOC 4
7440-38-2	Arsenic	1E-08	3E-04
111-44-4	bis(2-Chloroethyl)ether	6E-07	NC
79-34-5	1,1,2,2-Tetrachloroethane	8E-09	8E-06
79-00-5	1,1,2-Trichloroethane	5E-10	3E-05
75-35-4	1,1-Dichloroethene	NC	3E-06
107-06-2	1,2-Dichloroethane	7E-09	5E-05
71-43-2	Benzene	2E-08	1E-03
67-66-3	Chloroform	NC	7E-05
156-59-2	cis-1,2-Dichloroethene	NC	6E-04
127-18-4	Tetrachloroethene	9E-09	2E-05
79-01-6	Trichloroethene	1E-07	1E-02
75-01-4a	Vinyl chloride	8E-08	2E-04
		8E-07	1E-02

NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

Table 5-10
Summary of Potential Risks and Hazard Indices:
Recreational User (Adult) (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

		Excess Lifetime Cancer Risk									
		Sediment (ing/derm		Surface Water (derm		GW (ing)		Total-Sed/SW		Total-GW	
	Compound	CS	LTCS	CS	LTCS	AOC 1c	AOC 3	CS	LTCS	AOC 1c	AOC 3
71-55-6	1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
79-34-5	1,1,2,2-Tetrachloroethane	NA	NA	5E-09	NA	NA	3E-07	5E-09	NA	NA	3E-07
79-00-5	1,1,2-Trichloroethane	NA	NA	2E-09	NA	NA	1E-08	2E-09	NA	NA	1E-08
75-34-3	1,1-Dichloroethane	NA	NA	NC	NA	NA	NC	NA	NA	NA	NC
75-35-4	1,1-Dichloroethene	NA	NA	NC	NA	NA	NC	NA	NA	NA	NC
120-82-1	1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
95-50-1	1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
107-06-2	1,2-Dichloroethane	NA	NA	2E-09	NA	NA	1E-06	2E-09	NA	NA	1E-06
78-87-5	1,2-Dichloropropane	NA	NA	2E-09	NA	NA	1E-07	2E-09	NA	NA	1E-07
541-73-1	1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
106-46-7	1,4-Dichlorobenzene	NA	NA	NA	NA	NA	3E-09	NA	NA	NA	3E-09
78-93-3	2-Butanone	NA	NA	NC	NA	NA	NC	NA	NA	NA	NC
591-78-6	2-Hexanone	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA
106-47-8	4-Chloroaniline	NA	NA	NA	NA	NA	4E-08	NA	NA	NA	4E-08
108-10-1	4-Methyl-2-pentanone	NA	NA	NC	NA	NA	NC	NA	NA	NA	NC
67-64-1	Acetone	NA	NA	NC	NA	NA	NC	NA	NA	NA	NC
7429-90-5	Aluminum	NA	NA	NC	NC	NA	NC	NA	NC	NA	NC
7440-38-2	Arsenic	NA	NA	NA	NA	3E-07	2E-07	NA	NA	3E-07	2E-07
71-43-2	Benzene	NA	NA	4E-09	NA	NA	9E-07	4E-09	NA	NA	9E-07
7440-41-7	Beryllium	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
111-44-4	bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	5E-05	NA	NA	NA	5E-05
75-27-4	Bromodichloromethane	NA	NA	1E-09	NA	NA	NA	1E-09	NA	NA	NA
75-25-2	Bromoform	NA	NA	1E-10	NA	NA	NA	1E-10	NA	NA	NA
75-15-0	Carbon disulfide	NA	NA	NC	NA	NA	NC	NA	NA	NA	NC
56-23-5	Carbon Tetrachloride	NA	NA	1E-08	NA	NA	NA	1E-08	NA	NA	NA
108-90-7	Chlorobenzene	NA	NA	NC	NA	NA	NC	NA	NA	NA	NC
75-00-3	Chloroethane	NA	NA	6E-11	NA	NA	4E-10	6E-11	NA	NA	4E-10
67-66-3	Chloroform	NA	NA	NC	NA	NA	NC	NA	NA	NA	NC
74-87-3	Chloromethane	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA
7440-47-3	Chromium	NC	NC	NA	NA	NA	NC	NC	NC	NA	NC
156-59-2	cis-1,2-Dichloroethene	NA	NA	NC	NA	NA	NC	NA	NA	NA	NC
10061-01-5	cis-1,3-Dichloropropene	NA	NA	Request	NA	NA	NA	NC	NA	NA	NA
7440-48-4	Cobalt	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
124-48-1	Dibromochloromethane	NA	NA	2E-09	NA	NA	NA	2E-09	NA	NA	NA
100-41-4	Ethylbenzene	NA	NA	NA	NA	NA	NC	NC	NA	NA	NC
78-59-1	Isophorone	NA	NA	NA	NA	NA	2E-08	NC	NA	NA	2E-08
7439-92-1	Lead	Request	Request	NA	NA	NA	Request	NC	NC	NA	Request
7439-97-6	Mercury	NC	NC	NA	NA	NA	NA	NC	NC	NA	NA
75-09-2	Methylene chloride	NA	NA	1E-10	NA	NA	4E-07	1E-10	NA	NA	4E-07
91-20-3	Naphthalene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
7440-02-0	Nickel	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
98-95-3	Nitrobenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
85-01-8	Phenanthrene	NA	NA	Request	Request	NA	Request	NC	NC	NA	Request
7782-49-2	Selenium	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
100-42-5	Styrene	NA	NA	NC	NA	NA	NA	NA	NA	NA	NA
127-18-4	Tetrachloroethene	NA	NA	1E-07	NA	NA	8E-07	1E-07	NA	NA	8E-07
7440-28-0	Thallium	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
108-88-3	Toluene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
1336-36-3	Total PCBs	1E-07	3E-07	1E-08	3E-08	NA	NA	1E-07	3E-07	NA	NA
156-60-5	trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
10061-02-6	trans-1,3-Dichloropropene	NA	NA	Request	NA	NA	NA	NC	NA	NA	NA
79-01-6	Trichloroethene	NA	NA	2E-08	NA	NA	5E-05	2E-08	NA	NA	5E-05
7440-62-2	Vanadium	NC	NC	NA	NA	NA	NC	NA	NC	NA	NC
75-01-4a	Vinyl chloride	NA	NA	2E-08	NA	NA	2E-06	2E-08	NA	NA	2E-06
1330-20-7	Xylenes (Total)	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
7440-66-6	Zinc	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
								3E-07	3E-07	3E-07	1E-04

CS: Cedar Swamp: CS -H1B (Culvert -Tide Gate)
LTCS: Little Timber Creek Swamp: LTCS-H3 (R130-R44)
NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

800273

Table 5-10
Summary of Potential Risks and Hazard Indices:
Recreational User (Adult) (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

		Hazard Index									
		Sediment (ing/derm		Surface Water (de		GW (ing)		Total-Sed/SW		Total-GW	
	Compound	CS	LTCS	CS	LTCS	AOC 1c	AOC 3	CS	LTCS	AOC 1c	AOC 3
71-55-6	1,1,1-Trichloroethane	NA	NA	NA	NA	NA	9E-06	NA	NA	NA	9E-06
79-34-5	1,1,2,2-Tetrachloroethane	NA	NA	1E-06	NA	NA	8E-05	1E-06	NA	NA	8E-05
79-00-5	1,1,2-Trichloroethane	NA	NA	2E-05	NA	NA	2E-04	2E-05	NA	NA	2E-04
75-34-3	1,1-Dichloroethane	NA	NA	1E-06	NA	NA	5E-05	1E-06	NA	NA	5E-05
75-35-4	1,1-Dichloroethene	NA	NA	4E-06	NA	NA	9E-05	4E-06	NA	NA	9E-05
120-82-1	1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	7E-06	NA	NA	NA	7E-06
95-50-1	1,2-Dichlorobenzene	NA	NA	NA	NA	NA	5E-05	NA	NA	NA	5E-05
107-06-2	1,2-Dichloroethane	NA	NA	4E-06	NA	NA	2E-03	4E-06	NA	NA	2E-03
78-87-5	1,2-Dichloropropane	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
541-73-1	1,3-Dichlorobenzene	NA	NA	NA	NA	NA	2E-06	NA	NA	NA	2E-06
106-46-7	1,4-Dichlorobenzene	NA	NA	NA	NA	NA	1E-05	NA	NA	NA	1E-05
78-93-3	2-Butanone	NA	NA	1E-07	NA	NA	5E-04	1E-07	NA	NA	5E-04
591-78-6	2-Hexanone	NA	NA	7E-06	NA	NA	NA	7E-06	NA	NA	NA
106-47-8	4-Chloroaniline	NA	NA	NA	NA	NA	6E-04	NA	NA	NA	6E-04
108-10-1	4-Methyl-2-pentanone	NA	NA	3E-06	NA	NA	5E-03	3E-06	NA	NA	5E-03
67-64-1	Acetone	NA	NA	6E-08	NA	NA	2E-03	6E-08	NA	NA	2E-03
7429-90-5	Aluminum	NA	NA	2E-06	2E-06	NA	3E-03	2E-06	2E-06	NA	3E-03
7440-38-2	Arsenic	NA	NA	NA	NA	2E-03	1E-03	NA	NA	2E-03	1E-03
71-43-2	Benzene	NA	NA	6E-05	NA	NA	1E-02	6E-05	NA	NA	1E-02
7440-41-7	Beryllium	NA	NA	NA	NA	NA	5E-06	NA	NA	NA	5E-06
111-44-4	bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
75-27-4	Bromodichloromethane	NA	NA	4E-06	NA	NA	NA	4E-06	NA	NA	NA
75-25-2	Bromoform	NA	NA	2E-06	NA	NA	NA	2E-06	NA	NA	NA
75-15-0	Carbon disulfide	NA	NA	3E-06	NA	NA	1E-03	3E-06	NA	NA	1E-03
56-23-5	Carbon Tetrachloride	NA	NA	4E-04	NA	NA	NA	4E-04	NA	NA	NA
108-90-7	Chlorobenzene	NA	NA	7E-05	NA	NA	9E-05	7E-05	NA	NA	9E-05
75-00-3	Chloroethane	NA	NA	2E-07	NA	NA	1E-06	2E-07	NA	NA	1E-06
67-66-3	Chloroform	NA	NA	1E-05	NA	NA	5E-04	1E-05	NA	NA	5E-04
74-87-3	Chloromethane	NA	NA	NC	NA	NA	NA	NC	NA	NA	NA
7440-47-3	Chromium	2E-06	2E-06	NA	NA	NA	6E-07	2E-06	2E-06	NA	6E-07
156-59-2	cis-1,2-Dichloroethene	NA	NA	3E-05	NA	NA	1E-02	3E-05	NA	NA	1E-02
10061-01-5	cis-1,3-Dichloropropene	NA	NA	Request	NA	NA	NA	NC	NA	NA	NA
7440-48-4	Cobalt	NA	NA	NA	NA	NA	3E-04	NA	NA	NA	3E-04
124-48-1	Dibromochloromethane	NA	NA	3E-06	NA	NA	NA	3E-06	NA	NA	NA
100-41-4	Ethylbenzene	NA	NA	NA	NA	NA	3E-04	NA	NA	NA	3E-04
78-59-1	Isophorone	NA	NA	NA	NA	NA	4E-04	NA	NA	NA	4E-04
7439-92-1	Lead	Request	Request	NA	NA	NA	Request	NC	NC	NA	Request
7439-97-6	Mercury	NC	NC	NA	NA	NA	NA	NA	NC	NA	NA
75-09-2	Methylene chloride	NA	NA	1E-06	NA	NA	3E-03	1E-06	NA	NA	3E-03
91-20-3	Naphthalene	NA	NA	NA	NA	NA	1E-04	NA	NA	NA	1E-04
7440-02-0	Nickel	NA	NA	NA	NA	NA	6E-05	NA	NA	NA	6E-05
98-95-3	Nitrobenzene	NA	NA	NA	NA	NA	1E-04	NA	NA	NA	1E-04
85-01-8	Phenanthrene	NA	NA	Request	Request	NA	Request	NC	NC	NA	Request
7782-49-2	Selenium	NA	NA	NA	NA	NA	4E-04	NA	NA	NA	4E-04
100-42-5	Styrene	NA	NA	3E-06	NA	NA	NA	3E-06	NA	NA	NA
127-18-4	Tetrachloroethene	NA	NA	6E-05	NA	NA	5E-04	6E-05	NA	NA	5E-04
7440-28-0	Thallium	NA	NA	NA	NA	NA	5E-02	NA	NA	NA	5E-02
108-88-3	Toluene	NA	NA	NA	NA	NA	8E-04	NA	NA	NA	8E-04
1336-36-3	Total PCBs	9E-03	2E-02	1E-03	3E-03	NA	NA	1E-02	3E-02	NA	NA
156-60-5	trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	8E-05	NA	NA	NA	8E-05
10061-02-6	trans-1,3-Dichloropropene	NA	NA	Request	NA	NA	NA	NC	NA	NA	NA
79-01-6	Trichloroethene	NA	NA	6E-04	NA	NA	1E+00	6E-04	NA	NA	1E+00
7440-62-2	Vanadium	1E-03	1E-03	NA	NA	NA	4E-03	1E-03	1E-03	NA	4E-03
75-01-4a	Vinyl chloride	NA	NA	2E-05	NA	NA	2E-03	2E-05	NA	NA	2E-03
1330-20-7	Xylenes (Total)	NA	NA	2E-05	NA	NA	5E-04	2E-05	NA	NA	5E-04
7440-66-6	Zinc	NA	NA	NA	NA	NA	2E-03	NA	NA	NA	2E-03
								1E-02	3E-02	2E-03	1E+00

CS: Cedar Swamp: CS -H1B (Culvert -Tide Gate)
LTCS: Little Timber Creek Swamp: LTCS-H3 (R130-R44)
NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

800274

Table 5-11
Summary of Potential Risks and Hazard Indices:
Recreational User (Child) (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

		Excess Lifetime Cancer Risk									
		Sediment (ing/derm)		SW (derm)		GW (ing)		Total-Sed/SW		Total-GW	
	Compound	CS	LTCS	CS	LTCS	AOC 1c	AOC 3	CS	LTCS	AOC 1c	AOC 3
71-55-6	1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
79-34-5	1,1,2,2-Tetrachloroethane	NA	NA	2E-09	NA	NA	2E-07	2E-09	NA	NA	2E-07
79-00-5	1,1,2-Trichloroethane	NA	NA	7E-10	NA	NA	1E-08	7E-10	NA	NA	1E-08
75-34-3	1,1-Dichloroethane	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
75-35-4	1,1-Dichloroethene	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
120-82-1	1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
95-50-1	1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
107-06-2	1,2-Dichloroethane	NA	NA	8E-10	NA	NA	7E-07	8E-10	NA	NA	7E-07
78-87-5	1,2-Dichloropropane	NA	NA	9E-10	NA	NA	8E-08	9E-10	NA	NA	8E-08
541-73-1	1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
106-46-7	1,4-Dichlorobenzene	NA	NA	NA	NA	NA	2E-09	NA	NA	NA	2E-09
78-93-3	2-Butanone	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
591-78-6	2-Hexanone	NA	NA	NC	NA	NA	NA	NC	NA	NA	NA
106-47-8	4-Chloroaniline	NA	NA	NA	NA	NA	3E-08	NA	NA	NA	3E-08
108-10-1	4-Methyl-2-pentanone	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
67-64-1	Acetone	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
7429-90-5	Aluminum	NA	NA	NC	NC	NA	NC	NC	NC	NA	NC
7440-38-2	Arsenic	NA	NA	NA	NA	2E-07	1E-07	NA	NA	2E-07	1E-07
71-43-2	Benzene	NA	NA	2E-09	NA	NA	7E-07	2E-09	NA	NA	7E-07
7440-41-7	Beryllium	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
111-44-4	bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	3E-05	NA	NA	NA	3E-05
75-27-4	Bromodichloromethane	NA	NA	6E-10	NA	NA	NA	6E-10	NA	NA	NA
75-25-2	Bromoform	NA	NA	4E-11	NA	NA	NA	4E-11	NA	NA	NA
75-15-0	Carbon disulfide	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
56-23-5	Carbon Tetrachloride	NA	NA	5E-09	NA	NA	NA	5E-09	NA	NA	NA
108-90-7	Chlorobenzene	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
75-00-3	Chloroethane	NA	NA	3E-11	NA	NA	3E-10	3E-11	NA	NA	3E-10
67-66-3	Chloroform	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
74-87-3	Chloromethane	NA	NA	NC	NA	NA	NA	NC	NA	NA	NA
7440-47-3	Chromium	NC	NC	NA	NA	NA	NC	NA	NC	NA	NC
156-59-2	cis-1,2-Dichloroethene	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
10061-01-5	cis-1,3-Dichloropropene	NA	NA	Request	NA	NA	NA	NC	NA	NA	NA
7440-48-4	Cobalt	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
124-48-1	Dibromochloromethane	NA	NA	6E-10	NA	NA	NA	6E-10	NA	NA	NA
100-41-4	Ethylbenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
78-59-1	Isophorone	NA	NA	NA	NA	NA	2E-08	NA	NA	NA	2E-08
7439-92-1	Lead	Request	Request	NA	NA	NA	Request	NC	NC	NA	Request
7439-97-6	Mercury	NC	NC	NA	NA	NA	NA	NC	NC	NA	NA
75-09-2	Methylene chloride	NA	NA	6E-11	NA	NA	3E-07	6E-11	NA	NA	3E-07
91-20-3	Naphthalene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
7440-02-0	Nickel	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
98-95-3	Nitrobenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
85-01-8	Phenanthrene	NA	NA	Request	Request	NA	Request	NC	NC	NA	Request
7782-49-2	Selenium	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
100-42-5	Styrene	NA	NA	NC	NA	NA	NA	NC	NA	NA	NA
127-18-4	Tetrachloroethene	NA	NA	4E-08	NA	NA	6E-07	4E-08	NA	NA	6E-07
7440-28-0	Thallium	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
108-88-3	Toluene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
1336-36-3	Total PCBs	1E-07	3E-07	5E-09	1E-08	NA	NA	1E-07	3E-07	NA	NA
156-60-5	trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
10061-02-6	trans-1,3-Dichloropropene	NA	NA	Request	NA	NA	NA	NC	NA	NA	NA
79-01-6	Trichloroethene	NA	NA	9E-09	NA	NA	4E-05	9E-09	NA	NA	4E-05
7440-62-2	Vanadium	NC	NC	NA	NA	NA	NC	NC	NC	NA	NC
75-01-4a	Vinyl chloride	NA	NA	1E-08	NA	NA	2E-06	1E-08	NA	NA	2E-06
1330-20-7	Xylenes (Total)	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
7440-66-6	Zinc	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
								2E-07	3E-07	2E-07	7E-05

CS: Cedar Swamp: CS -H1B (Culvert -Tide Gate)
LTCS: Little Timber Creek Swamp: LTCS-H3 (R130-R44)
NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

800275

Table 5-11
Summary of Potential Risks and Hazard Indices:
Recreational User (Child) (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

		Hazard Index									
		Sediment (ing/derm		SW (derm)		GW (ing)		Total-Sed/SW		Total-GW	
	Compound	CS	LTCS	CS	LTCS	AOC 1c	AOC 3	CS	LTCS	AOC 1c	AOC 3
71-55-6	1,1,1-Trichloroethane	NA	NA	NA	NA	NA	2E-05	NA	NA	NA	2E-05
79-34-5	1,1,2,2-Tetrachloroethane	NA	NA	2E-06	NA	NA	2E-04	2E-06	NA	NA	2E-04
79-00-5	1,1,2-Trichloroethane	NA	NA	4E-05	NA	NA	6E-04	4E-05	NA	NA	6E-04
75-34-3	1,1-Dichloroethane	NA	NA	2E-06	NA	NA	1E-04	2E-06	NA	NA	1E-04
75-35-4	1,1-Dichloroethene	NA	NA	7E-06	NA	NA	3E-04	7E-06	NA	NA	3E-04
120-82-1	1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	2E-05	NA	NA	NA	2E-05
95-50-1	1,2-Dichlorobenzene	NA	NA	NA	NA	NA	1E-04	NA	NA	NA	1E-04
107-06-2	1,2-Dichloroethane	NA	NA	6E-06	NA	NA	5E-03	6E-06	NA	NA	5E-03
78-87-5	1,2-Dichloropropane	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
541-73-1	1,3-Dichlorobenzene	NA	NA	NA	NA	NA	5E-06	NA	NA	NA	5E-06
106-46-7	1,4-Dichlorobenzene	NA	NA	NA	NA	NA	4E-05	NA	NA	NA	4E-05
78-93-3	2-Butanone	NA	NA	2E-07	NA	NA	1E-03	2E-07	NA	NA	1E-03
591-78-6	2-Hexanone	NA	NA	1E-05	NA	NA	NA	1E-05	NA	NA	NA
106-47-8	4-Chloroaniline	NA	NA	NA	NA	NA	2E-03	NA	NA	NA	2E-03
108-10-1	4-Methyl-2-pentanone	NA	NA	5E-06	NA	NA	1E-02	5E-06	NA	NA	1E-02
67-64-1	Acetone	NA	NA	1E-07	NA	NA	7E-03	1E-07	NA	NA	7E-03
7429-90-5	Aluminum	NA	NA	3E-06	3E-06	NA	9E-03	3E-06	3E-06	NA	9E-03
7440-38-2	Arsenic	NA	NA	NA	NA	6E-03	4E-03	NA	NA	6E-03	4E-03
71-43-2	Benzene	NA	NA	9E-05	NA	NA	4E-02	9E-05	NA	NA	4E-02
7440-41-7	Beryllium	NA	NA	NA	NA	NA	1E-05	NA	NA	NA	1E-05
111-44-4	bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
75-27-4	Bromodichloromethane	NA	NA	6E-06	NA	NA	NA	6E-06	NA	NA	NA
75-25-2	Bromoform	NA	NA	3E-06	NA	NA	NA	3E-06	NA	NA	NA
75-15-0	Carbon disulfide	NA	NA	5E-06	NA	NA	3E-03	5E-06	NA	NA	3E-03
56-23-5	Carbon Tetrachloride	NA	NA	7E-04	NA	NA	NA	7E-04	NA	NA	NA
108-90-7	Chlorobenzene	NA	NA	1E-04	NA	NA	2E-04	1E-04	NA	NA	2E-04
75-00-3	Chloroethane	NA	NA	3E-07	NA	NA	3E-06	3E-07	NA	NA	3E-06
67-66-3	Chloroform	NA	NA	2E-05	NA	NA	1E-03	2E-05	NA	NA	1E-03
74-87-3	Chloromethane	NA	NA	NC	NA	NA	NA	NC	NA	NA	NA
7440-47-3	Chromium	4E-06	7E-06	NA	NA	NA	2E-06	4E-06	7E-06	NA	2E-06
156-59-2	cis-1,2-Dichloroethene	NA	NA	4E-05	NA	NA	3E-02	4E-05	NA	NA	3E-02
10061-01-5	cis-1,3-Dichloropropene	NA	NA	Request	NA	NA	NA	NC	NA	NA	NA
7440-48-4	Cobalt	NA	NA	NA	NA	NA	8E-04	NA	NA	NA	8E-04
124-48-1	Dibromochloromethane	NA	NA	4E-06	NA	NA	NA	4E-06	NA	NA	NA
100-41-4	Ethylbenzene	NA	NA	NA	NA	NA	8E-04	NA	NA	NA	8E-04
78-59-1	Isophorone	NA	NA	NA	NA	NA	1E-03	NA	NA	NA	1E-03
7439-92-1	Lead	Request	Request	NA	NA	NA	Request	NC	NC	NA	Request
7439-97-6	Mercury	NC	NC	NA	NA	NA	NA	NC	NC	NA	NA
75-09-2	Methylene chloride	NA	NA	2E-06	NA	NA	8E-03	2E-06	NA	NA	8E-03
91-20-3	Naphthalene	NA	NA	NA	NA	NA	4E-04	NC	NA	NA	4E-04
7440-02-0	Nickel	NA	NA	NA	NA	NA	2E-04	NC	NA	NA	2E-04
98-95-3	Nitrobenzene	NA	NA	NA	NA	NA	4E-04	NC	NA	NA	4E-04
85-01-8	Phenanthrene	NA	NA	Request	Request	NA	Request	NC	NC	NA	Request
7782-49-2	Selenium	NA	NA	NA	NA	NA	1E-03	NC	NA	NA	1E-03
100-42-5	Styrene	NA	NA	5E-06	NA	NA	NA	5E-06	NA	NA	NA
127-18-4	Tetrachloroethene	NA	NA	9E-05	NA	NA	1E-03	9E-05	NA	NA	1E-03
7440-28-0	Thallium	NA	NA	NA	NA	NA	1E-01	NC	NA	NA	1E-01
108-88-3	Toluene	NA	NA	NA	NA	NA	2E-03	NC	NA	NA	2E-03
1336-36-3	Total PCBs	4E-02	9E-02	2E-03	4E-03	NA	NA	4E-02	9E-02	NA	NA
156-60-5	trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	2E-04	NC	NA	NA	2E-04
10061-02-6	trans-1,3-Dichloropropene	NA	NA	Request	NA	NA	NA	NC	NA	NA	NA
79-01-6	Trichloroethene	NA	NA	1E-03	NA	NA	4E+00	1E-03	NA	NA	4E+00
7440-62-2	Vanadium	4E-03	4E-03	NA	NA	NA	1E-02	4E-03	4E-03	NA	1E-02
75-01-4a	Vinyl chloride	NA	NA	4E-05	NA	NA	6E-03	4E-05	NA	NA	6E-03
1330-20-7	Xylenes (Total)	NA	NA	3E-05	NA	NA	1E-03	3E-05	NA	NA	1E-03
7440-66-6	Zinc	NA	NA	NA	NA	NA	5E-03	NC	NA	NA	5E-03
								4E-02	1E-01	6E-03	4E+00

CS: Cedar Swamp: CS -H1B (Culvert -Tide Gate)
LTCS: Little Timber Creek Swamp: LTCS-H3 (R130-R44)
NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

800276

Table 5-12a
Summary of Potential Risks and Hazard Indices:
Recreational User (Adult + Child) (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

		Excess Lifetime Cancer Risk									
		Sediment (ing/derm)		SW (derm)		GW (ing)		Total-Sed/SW		Total-GW	
	Compound	CS	LTCS	CS	LTCS	AOC 1c	AOC 3	CS	LTCS	AOC 1c	AOC 3
71-55-6	1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
79-34-5	1,1,2,2-Tetrachloroethane	NA	NA	7E-09	NA	NA	6E-07	7E-09	NA	NA	6E-07
79-00-5	1,1,2-Trichloroethane	NA	NA	2E-09	NA	NA	3E-08	2E-09	NA	NA	3E-08
75-34-3	1,1-Dichloroethane	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
75-35-4	1,1-Dichloroethene	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
120-82-1	1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
95-50-1	1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
107-06-2	1,2-Dichloroethane	NA	NA	3E-09	NA	NA	2E-06	3E-09	NA	NA	2E-06
78-87-5	1,2-Dichloropropane	NA	NA	3E-09	NA	NA	2E-07	3E-09	NA	NA	2E-07
541-73-1	1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
106-46-7	1,4-Dichlorobenzene	NA	NA	NA	NA	NA	5E-09	NA	NA	NA	5E-09
78-93-3	2-Butanone	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
591-78-6	2-Hexanone	NA	NA	NC	NA	NA	NA	NC	NA	NA	NA
106-47-8	4-Chloroaniline	NA	NA	NA	NA	NA	7E-08	NA	NA	NA	7E-08
108-10-1	4-Methyl-2-pentanone	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
67-64-1	Acetone	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
7429-90-5	Aluminum	NA	NA	NC	NC	NA	NC	NC	NC	NA	NC
7440-38-2	Arsenic	NA	NA	NA	NA	5E-07	3E-07	NA	NA	5E-07	3E-07
71-43-2	Benzene	NA	NA	5E-09	NA	NA	2E-06	5E-09	NA	NA	2E-06
7440-41-7	Beryllium	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
111-44-4	bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	8E-05	NA	NA	NA	8E-05
75-27-4	Bromodichloromethane	NA	NA	2E-09	NA	NA	NA	2E-09	NA	NA	NA
75-25-2	Bromoform	NA	NA	2E-10	NA	NA	NA	2E-10	NA	NA	NA
75-15-0	Carbon disulfide	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
56-23-5	Carbon Tetrachloride	NA	NA	2E-08	NA	NA	NA	2E-08	NA	NA	NA
108-90-7	Chlorobenzene	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
75-00-3	Chloroethane	NA	NA	9E-11	NA	NA	7E-10	9E-11	NA	NA	7E-10
67-66-3	Chloroform	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
74-87-3	Chloromethane	NA	NA	NC	NA	NA	NA	NC	NA	NA	NA
7440-47-3	Chromium	NC	NC	NA	NA	NA	NC	NC	NC	NA	NC
156-59-2	cis-1,2-Dichloroethene	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
10061-01-5	cis-1,3-Dichloropropene	NA	NA	Request	NA	NA	NA	NC	NA	NA	NA
7440-48-4	Cobalt	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
124-48-1	Dibromochloromethane	NA	NA	2E-09	NA	NA	NA	2E-09	NA	NA	NA
100-41-4	Ethylbenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
78-59-1	Isophorone	NA	NA	NA	NA	NA	4E-08	NA	NA	NA	4E-08
7439-92-1	Lead	Request	Request	NA	NA	NA	Request	NC	NC	NA	Request
7439-97-6	Mercury	NC	NC	NA	NA	NA	NA	NC	NC	NA	NA
75-09-2	Methylene chloride	NA	NA	2E-10	NA	NA	7E-07	2E-10	NA	NA	7E-07
91-20-3	Naphthalene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
7440-02-0	Nickel	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
98-95-3	Nitrobenzene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
85-01-8	Phenanthrene	NA	NA	Request	Request	NA	Request	NC	NC	NA	Request
7782-49-2	Selenium	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
100-42-5	Styrene	NA	NA	NC	NA	NA	NA	NC	NA	NA	NA
127-18-4	Tetrachloroethene	NA	NA	1E-07	NA	NA	1E-06	1E-07	NA	NA	1E-06
7440-28-0	Thallium	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
108-88-3	Toluene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
1336-36-3	Total PCBs	2E-07	6E-07	2E-08	5E-08	NA	NA	3E-07	6E-07	NA	NA
156-60-5	trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
10061-02-6	trans-1,3-Dichloropropene	NA	NA	Request	NA	NA	NA	NC	NA	NA	NA
79-01-6	Trichloroethene	NA	NA	3E-08	NA	NA	9E-05	3E-08	NA	NA	9E-05
7440-62-2	Vanadium	NC	NC	NA	NA	NA	NC	NC	NC	NA	NC
75-01-4a	Vinyl chloride	NA	NA	3E-08	NA	NA	4E-06	3E-08	NA	NA	4E-06
1330-20-7	Xylenes (Total)	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
7440-66-6	Zinc	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
								5E-07	6E-07	5E-07	2E-04

Total Hazard indices are a weighted sum of adult and child (i.e. (Adult * 24y + Child * 6y) / 30y
Cancer Risks are a sum of adult and child (i.e. Adult + Child)
CS: Cedar Swamp: CS -H1B (Culvert -Tide Gate)
LTCS: Little Timber Creek Swamp: LTCS-H3 (R130-R44)
NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

800277

Table 5-12a
Summary of Potential Risks and Hazard Indices:
Recreational User (Adult + Child) (RME)
BROS Human Health Risk Assessment
Bridgeport, NJ

		Hazard Index									
		Sediment (ing/derm		SW (derm)		GW (ing)		Total-Sed/SW		Total-GW	
	Compound	CS	LTCS	CS	LTCS	AOC 1c	AOC 3	CS	LTCS	AOC 1c	AOC 3
71-55-6	1,1,1-Trichloroethane	NA	NA	NA	NA	NA	1E-05	NA	NA	NA	1E-05
79-34-5	1,1,2,2-Tetrachloroethane	NA	NA	2E-06	NA	NA	1E-04	2E-06	NA	NA	1E-04
79-00-5	1,1,2-Trichloroethane	NA	NA	3E-05	NA	NA	3E-04	3E-05	NA	NA	3E-04
75-34-3	1,1-Dichloroethane	NA	NA	1E-06	NA	NA	7E-05	1E-06	NA	NA	7E-05
75-35-4	1,1-Dichloroethene	NA	NA	5E-06	NA	NA	1E-04	5E-06	NA	NA	1E-04
120-82-1	1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	9E-06	NA	NA	NA	9E-06
95-50-1	1,2-Dichlorobenzene	NA	NA	NA	NA	NA	6E-05	NA	NA	NA	6E-05
107-06-2	1,2-Dichloroethane	NA	NA	4E-06	NA	NA	2E-03	4E-06	NA	NA	2E-03
78-87-5	1,2-Dichloropropane	NA	NA	NC	NA	NA	NC	NC	NA	NA	NC
541-73-1	1,3-Dichlorobenzene	NA	NA	NA	NA	NA	3E-06	NA	NA	NA	3E-06
106-46-7	1,4-Dichlorobenzene	NA	NA	NA	NA	NA	2E-05	NA	NA	NA	2E-05
78-93-3	2-Butanone	NA	NA	2E-07	NA	NA	7E-04	2E-07	NA	NA	7E-04
591-78-6	2-Hexanone	NA	NA	8E-06	NA	NA	NA	8E-06	NA	NA	NA
106-47-8	4-Chloroaniline	NA	NA	NA	NA	NA	9E-04	NA	NA	NA	9E-04
108-10-1	4-Methyl-2-pentanone	NA	NA	4E-06	NA	NA	6E-03	4E-06	NA	NA	6E-03
67-64-1	Acetone	NA	NA	7E-08	NA	NA	3E-03	7E-08	NA	NA	3E-03
7429-90-5	Aluminum	NA	NA	2E-06	2E-06	NA	5E-03	2E-06	2E-06	NA	5E-03
7440-38-2	Arsenic	NA	NA	NA	NA	3E-03	2E-03	NA	NA	3E-03	2E-03
71-43-2	Benzene	NA	NA	6E-05	NA	NA	2E-02	6E-05	NA	NA	2E-02
7440-41-7	Beryllium	NA	NA	NA	NA	NA	7E-06	NA	NA	NA	7E-06
111-44-4	bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NC	NA	NA	NA	NC
75-27-4	Bromodichloromethane	NA	NA	4E-06	NA	NA	NA	4E-06	NA	NA	NA
75-25-2	Bromoform	NA	NA	2E-06	NA	NA	NA	2E-06	NA	NA	NA
75-15-0	Carbon disulfide	NA	NA	3E-06	NA	NA	1E-03	3E-06	NA	NA	1E-03
56-23-5	Carbon Tetrachloride	NA	NA	5E-04	NA	NA	NA	5E-04	NA	NA	NA
108-90-7	Chlorobenzene	NA	NA	8E-05	NA	NA	1E-04	8E-05	NA	NA	1E-04
75-00-3	Chloroethane	NA	NA	2E-07	NA	NA	2E-06	2E-07	NA	NA	2E-06
67-66-3	Chloroform	NA	NA	1E-05	NA	NA	7E-04	1E-05	NA	NA	7E-04
74-87-3	Chloromethane	NA	NA	NC	NA	NA	NA	NC	NA	NA	NA
7440-47-3	Chromium	2E-06	3E-06	NA	NA	NA	8E-07	2E-06	3E-06	NA	8E-07
156-59-2	cis-1,2-Dichloroethene	NA	NA	3E-05	NA	NA	2E-02	3E-05	NA	NA	2E-02
10061-01-5	cis-1,3-Dichloropropene	NA	NA	Request	NA	NA	NA	NC	NA	NA	NA
7440-48-4	Cobalt	NA	NA	NA	NA	NA	4E-04	NA	NA	NA	4E-04
124-48-1	Dibromochloromethane	NA	NA	3E-06	NA	NA	NA	3E-06	NA	NA	NA
100-41-4	Ethylbenzene	NA	NA	NA	NA	NA	4E-04	NA	NA	NA	4E-04
78-59-1	Isophorone	NA	NA	NA	NA	NA	6E-04	NA	NA	NA	6E-04
7439-92-1	Lead	Request	Request	NA	NA	NA	Request	NC	NC	NA	Request
7439-97-6	Mercury	NC	NC	NA	NA	NA	NA	NC	NC	NA	NA
75-09-2	Methylene chloride	NA	NA	1E-06	NA	NA	4E-03	1E-06	NA	NA	4E-03
91-20-3	Naphthalene	NA	NA	NA	NA	NA	2E-04	NA	NA	NA	2E-04
7440-02-0	Nickel	NA	NA	NA	NA	NA	9E-05	NA	NA	NA	9E-05
98-95-3	Nitrobenzene	NA	NA	NA	NA	NA	2E-04	NA	NA	NA	2E-04
85-01-8	Phenanthrene	NA	NA	Request	Request	NA	Request	NC	NC	NA	Request
7782-49-2	Selenium	NA	NA	NA	NA	NA	5E-04	NA	NA	NA	5E-04
100-42-5	Styrene	NA	NA	3E-06	NA	NA	NA	3E-06	NA	NA	NA
127-18-4	Tetrachloroethene	NA	NA	6E-05	NA	NA	6E-04	6E-05	NA	NA	6E-04
7440-28-0	Thallium	NA	NA	NA	NA	NA	7E-02	NA	NA	NA	7E-02
108-88-3	Toluene	NA	NA	NA	NA	NA	1E-03	NA	NA	NA	1E-03
1336-36-3	Total PCBs	1E-02	4E-02	1E-03	3E-03	NA	NA	2E-02	4E-02	NA	NA
156-60-5	trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	1E-04	NA	NA	NA	1E-04
10061-02-6	trans-1,3-Dichloropropene	NA	NA	Request	NA	NA	NA	NC	NA	NA	NA
79-01-6	Trichloroethene	NA	NA	7E-04	NA	NA	2E+00	7E-04	NA	NA	2E+00
7440-62-2	Vanadium	2E-03	2E-03	NA	NA	NA	5E-03	2E-03	2E-03	NA	5E-03
75-01-4a	Vinyl chloride	NA	NA	3E-05	NA	NA	3E-03	3E-05	NA	NA	3E-03
1330-20-7	Xylenes (Total)	NA	NA	2E-05	NA	NA	6E-04	2E-05	NA	NA	6E-04
7440-66-6	Zinc	NA	NA	NA	NA	NA	2E-03	NA	NA	NA	2E-03
								2E-02	4E-02	3E-03	2E+00

Total Hazard indices are a weighted sum of adult and child (i.e. (Adult * 24y + Child * 6y) / 30y
Cancer Risks are a sum of adult and child (i.e. Adult + Child)
CS: Cedar Swamp: CS -H1B (Culvert -Tide Gate)
LTCS: Little Timber Creek Swamp: LTCS-H3 (R130-R44)
NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

800278

Table 5-12b
Summary of Potential Risks and Hazard Indices:
Recreational User (Adult + Child) (CTE)
BROS Human Health Risk Assessment
Bridgeport, NJ

		GW-ingestion	
		Excess Lifetime Cancer Risk	Hazard Index
Compound		AOC 3	AOC 3
71-55-6	1,1,1-Trichloroethane	NC	3E-06
79-34-5	1,1,2,2-Tetrachloroethane	2E-07	3E-05
79-00-5	1,1,2-Trichloroethane	7E-09	8E-05
75-34-3	1,1-Dichloroethane	NC	2E-05
75-35-4	1,1-Dichloroethene	NC	3E-05
120-82-1	1,2,4-Trichlorobenzene	NC	3E-06
95-50-1	1,2-Dichlorobenzene	NC	2E-05
107-06-2	1,2-Dichloroethane	5E-07	6E-04
78-87-5	1,2-Dichloropropane	6E-08	NC
541-73-1	1,3-Dichlorobenzene	NC	7E-07
106-46-7	1,4-Dichlorobenzene	1E-09	5E-06
78-93-3	2-Butanone	NC	2E-04
106-47-8	4-Chloroaniline	2E-08	2E-04
108-10-1	4-Methyl-2-pentanone	NC	2E-03
67-64-1	Acetone	NC	9E-04
7429-90-5	Aluminum	NC	1E-03
7440-38-2	Arsenic	9E-08	5E-04
71-43-2	Benzene	5E-07	5E-03
7440-41-7	Beryllium	NC	2E-06
111-44-4	bis(2-Chloroethyl)ether	2E-05	NC
75-15-0	Carbon disulfide	NC	4E-04
108-90-7	Chlorobenzene	NC	3E-05
75-00-3	Chloroethane	2E-10	4E-07
67-66-3	Chloroform	NC	2E-04
7440-47-3	Chromium	NC	2E-07
156-59-2	cis-1,2-Dichloroethene	NC	5E-03
7440-48-4	Cobalt	NC	1E-04
100-41-4	Ethylbenzene	NC	1E-04
78-59-1	Isophorone	1E-08	2E-04
7439-92-1	Lead	Request	Request
75-09-2	Methylene chloride	2E-07	1E-03
91-20-3	Naphthalene	NC	5E-05
7440-02-0	Nickel	NC	2E-05
98-95-3	Nitrobenzene	NC	5E-05
85-01-8	Phenanthrene	Request	Request
7782-49-2	Selenium	NC	1E-04
127-18-4	Tetrachloroethene	4E-07	2E-04
7440-28-0	Thallium	NC	2E-02
108-88-3	Toluene	NC	3E-04
156-60-5	trans-1,2-Dichloroethene	NC	3E-05
79-01-6	Trichloroethene	3E-05	5E-01
7440-62-2	Vanadium	NC	1E-03
75-01-4a	Vinyl chloride	1E-06	8E-04
1330-20-7	Xylenes (Total)	NC	2E-04
7440-66-6	Zinc	NC	7E-04
		5E-05	6E-01

Total Hazard indices are a weighted sum of adult and child (i.e. (Adult * 24y + Child * 6y) / 30y
Cancer Risks are a sum of adult and child (i.e. Adult + Child)
NA: Not a COPC in AOC or medium
NC: HI and/or Risk not calculated, tox info either does not exist or is not available

Table 5-13. Crosstabulation of "Risk-Driving" Chemicals by Chemical Class and Evaluated Area from the Vapor Intrusion Evaluation.

		Soil Hot Spot 2		Soil Hot Spot 1		West Side Property		South Side Property		Remainder BROS Property		Remainder BROS Property - Former Lagoon Area	
	Scenario	Future Use, Commercial		Future Use, Commercial		Future Use, Commercial		Future Use, Commercial		Future Use, Commercial		Future Use, Commercial	
Chemical	Class	Carc	NonCarc	Carc	NonCarc	Carc	NonCarc	Carc	NonCarc	Carc	NonCarc	Carc	NonCarc
Total PCBs	PCBs	X		X		X				X			
bis(2-Chloroethyl)ether	SVOCs							X		X		X	
Naphthalene	SVOCs		X		X								
Phenanthrene	SVOCs		X		X						X		
Phenol	SVOCs				X								
1,2-Dichloroethane	VOCs			X								X	
1,2-Dichloropropane	VOCs											X	
Benzene	VOCs	X		X		X				X		X	
Chloroethane	VOCs											X	
Chloroform	VOCs			X								X	
cis-1,2-Dichloroethene	VOCs				X								
Methylene chloride	VOCs											X	
Tetrachloroethene	VOCs											X	
Trichloroethene	VOCs			X	X	X				X		X	X
Vinyl chloride	VOCs	X		X	X	X						X	
Xylenes (Total)	VOCs		X		X								

Notes:
Results are summarized from the RME and combined soil and groundwater risk results from the different exposure areas.
See text for distinction between "Remainder BROS Property" and "Remainder BROS Property - Former Lagoon Area"
"Carc" refers to potential carinogenic risks above 1E-6, and "NonCarc" refers to potential non-carcinogenic risks greater than 1.
This compilation includes some chemicals that did not contribute to 90% of the total calculated risk, but were still above risk thresholds.

Exterior of Pepper Building, north side (view to southwest). Note the large open doorway.

Exterior of Pepper Building, north side (view to southeast).

Photograph 1-1. Exterior views of the Pepper Building.

Pepper Building interior views showing quality of existing floor slab and wall-floor seam

Photograph 1-2. Interior views of the Pepper Building.

ANNEX (ES)

ANNEX A
SUMMARY OF JOHNSON & ETTINGER VAPOR INTRUSION VAPOR EXPOSURE POINT CONCENTRATIONS AND RISK RESULTS

ANNEX A
SUMMARY OF JOHNSON & ETTINGER VAPOR INTRUSION VAPOR EXPOSURE POINT CONCENTRATIONS AND RISK RESULTS

PREFACE

The annex contains tables that summarize the Exposure Point Concentrations that were generated for use in the Johnson & Ettinger Vapor Intrusion Models for ground water and soils, and the detailed risk results by evaluated area and chemical. The exposure assumptions are presented in Tables 3-12 through 3-15 of the HHRA Report.

List of Tables

Table A-1. List of Samples Used to Derive EPCs for Soil Vapor Intrusion Modeling

AREA EVALUATED	
Media	**Samples**
Soil Hot Spot 1 (Soil AOC-1)	
Soil	P-36
Ground water	MW-32S
Soil Hot Spot 2 (Soil AOC-6)	
Soil	PB-3 and PB-4
Ground water	MW-24S and P-5
South Side Property (Soil AOC-4)	
Soil	L-14B
Ground water	MW-23S, MW-4A, S-1A, and S-1B
West Side Property (Soil AOC-5)	
Soil	P-21
Ground water	MW-24S, MW-27S, and P-5
Remainder of BROS Property (Excludes Former Lagoon Area)	
Soil	L-11B, MW-25S, N-19, N-40, N-41, N-42, P-26, P-27, P-31, P-34, P-38, P-40, P-43, P-44
Ground water	MW-1A, MW-13A, MW-25S, MW-30S, MW-31S, MW-36S, S-11A, S-3A, and WMW-2B
Former Lagoon Area	
Soil	None
Groundwater	MW-26S

Notes:

Soils from 0 to 6-ft depth interval were used for these calculations. Multiple sampling depths were treated as independent samples for all calculations.

Groundwater wells representing the water table were used for these calculations. Multiple sampling rounds were treated as independent samples for all calculations.

The Former Lagoon Area ground water was represented by well MW-26S.

Table A-2. Johnson & Ettinger Model - Summary of Concentrations of Ground Water (Water Table) Samples Located in Soil Hot Spot 2 (Soil AOC-6

Chem Class	Analyte	Freq	Freq%	Mean	StdDev	ND Range	Pos Range	GeoMean	95UCL-T	95UCL-H	Comment	95UCL Value	Units
PCBs	Aroclor-1242	2/2	100%	38.3	50.5	---	2.6 - 74	13.9	4.9E+02		Max Value Used	74.0	µg/L
PCBs	Aroclor-1260	2/2	100%	101.0	125.9	---	12 - 190	47.7	1.2E+03		Max Value Used	190.0	µg/L
PCBs	Total PCBs	2/2	100%	139.3	176.4	---	264	62.1	1.7E+03		Max Value Used	264.0	µg/L
SVOCs	2,4-Dimethylphenol	1/2	50%	75.3	105.7	1 - 1	150 - 150	8.7	1.0E+03		Max Value Used	150.0	µg/L
SVOCs	2-Methylnapthalene	1/3	33%	0.7	0.3	1 - 1	1 - 1	0.6	1.4E+00	3.0E+00	Max Value Used	1.0	µg/L
SVOCs	2-Methylphenol	1/2	50%	0.8	0.4	1 - 1	1 - 1	0.7	3.9E+00		Max Value Used	1.0	µg/L
SVOCs	4-Chloro-3-methylphenol	1/2	50%	0.8	0.4	1 - 1	1 - 1	0.7	3.9E+00		Max Value Used	1.0	µg/L
SVOCs	4-Methylphenol	1/2	50%	4.8	4.6	3 - 3	8 - 8	3.5	4.6E+01		Max Value Used	8.0	µg/L
SVOCs	Acenaphthene	1/3	33%	0.7	0.3	1 - 1	1 - 1	0.6	1.4E+00	3.0E+00	Max Value Used	1.0	µg/L
SVOCs	bis(2-Ethylhexyl)phthalate	2/3	67%	4.7	4.7	2 - 2	3 - 10	3.1	1.6E+01	1.3E+06	Max Value Used	10.0	µg/L
SVOCs	Chrysene	1/3	33%	0.7	0.3	1 - 1	1 - 1	0.6	1.4E+00	3.0E+00	Max Value Used	1.0	µg/L
SVOCs	Di-n-octyl phthalate	1/3	33%	1.3	0.6	2 - 2	2 - 2	1.3	2.8E+00	6.0E+00	Max Value Used	2.0	µg/L
SVOCs	Fluoranthene	1/3	33%	0.7	0.3	1 - 1	1 - 1	0.6	1.4E+00	3.0E+00	Max Value Used	1.0	µg/L
SVOCs	Fluorene	2/3	67%	1.5	1.3	1 - 1	1 - 3	1.1	4.8E+00	3.2E+03	Max Value Used	3.0	µg/L
SVOCs	Naphthalene	1/3	33%	1.0	0.9	1 - 1	2 - 2	0.8	3.2E+00	4.0E+02	Max Value Used	2.0	µg/L
SVOCs	n-Nitrosodiphenylamine	3/3	100%	3.3	2.5	---	1 - 6	2.6	9.6E+00	7.3E+03	Max Value Used	6.0	µg/L
SVOCs	Phenanthrene	1/3	33%	2.0	2.6	1 - 1	5 - 5	1.1	8.5E+00	3.2E+07	Max Value Used	5.0	µg/L
SVOCs	Phenol	1/2	50%	1.3	1.1	1 - 1	2 - 2	1.0	1.1E+01		Max Value Used	2.0	µg/L
SVOCs	Pyrene	2/3	67%	1.5	1.3	1 - 1	1 - 3	1.1	4.8E+00	3.2E+03	Max Value Used	3.0	µg/L
VOCs	1,1-Dichloroethane	1/3	33%	1.5	1.3	1 - 2	3 - 3	1.1	4.8E+00	3.2E+03	Max Value Used	3.0	µg/L
VOCs	1,2,4-Trichlorobenzene	3/3	100%	4.2	1.4	---	2.5 - 5	4.0	7.8E+00	1.9E+01	Max Value Used	5.0	µg/L
VOCs	1,2-Dichlorobenzene	1/3	33%	1.0	0.9	1 - 1	2 - 2	0.8	3.2E+00	4.0E+02	Max Value Used	2.0	µg/L
VOCs	1,3-Dichlorobenzene	1/3	33%	0.7	0.3	1 - 1	1 - 1	0.6	1.4E+00	3.0E+00	Max Value Used	1.0	µg/L
VOCs	1,4-Dichlorobenzene	1/3	33%	1.0	0.9	1 - 1	2 - 2	0.8	3.2E+00	4.0E+02	Max Value Used	2.0	µg/L
VOCs	Acetone	1/3	33%	6.7	6.4	6 - 6	14 - 14	5.0	2.2E+01	1.1E+04	Max Value Used	14.0	µg/L
VOCs	Benzene	3/3	100%	9.7	14.2	---	1 - 26	3.7	4.5E+01	1.1E+13	Max Value Used	26.0	µg/L
VOCs	Chloroethane	1/3	33%	1.5	0.5	2 - 3	2 - 2	1.4	2.7E+00	4.8E+00	Max Value Used	2.0	µg/L
VOCs	cis-1,2-Dichloroethene	1/3	33%	0.8	0.3	1 - 2	1 - 1	0.8	1.6E+00	3.8E+00	Max Value Used	1.0	µg/L
VOCs	Ethylbenzene	2/3	67%	6.0	8.7	2 - 2	1 - 16	2.5	2.8E+01	1.7E+11	Max Value Used	16.0	µg/L
VOCs	Tetrachloroethene	1/3	33%	0.7	0.3	1 - 1	1 - 1	0.6	1.4E+00	3.0E+00	Max Value Used	1.0	µg/L
VOCs	Toluene	1/3	33%	1.2	0.8	1 - 2	2 - 2	1.0	3.1E+00	1.1E+02	Max Value Used	2.0	µg/L
VOCs	Vinyl chloride	1/3	33%	0.8	0.3	1 - 2	1 - 1	0.8	1.6E+00	3.8E+00	Max Value Used	1.0	µg/L
VOCs	Xylenes (Total)	3/3	100%	12.3	17.9	---	1 - 33	4.6	5.7E+01	1.5E+14	Max Value Used	33.0	µg/L

Note:
Only those chemicals with a frequency of detection greater than 5% were included in the J&E Model runs.
95UCL-H can not be calculated for sample sizes less than 3.

800289

Table A-3. Johnson & Ettinger Model - Summary of Concentrations of Soil Samples Located in Soil Hot Spot 2 (Soil AOC-6)

Chem Class	Analyte	Freq	Freq%	Mean	StdDev	ND Range	Pos Range	GeoMean	95UCL-T	95UCL_H	Comment	95UCL Value	Conc Units
PCBs	Aroclor-1248	3/3	100%	1,130	1,459	---	100 - 2800	515.8	4.8E+03	2.9E+14	Max Used	2,800	µg/Kg
PCBs	Aroclor-1260	3/3	100%	3,523	4,301	---	270 - 8400	1,627	1.4E+04	6.1E+15	Max Used	8,400	µg/Kg
PCBs	Total PCBs	3/3	100%	4,653	5,759	---	11200	2,148	1.9E+04	4.6E+15	Max Used	11,200	µg/Kg
SVOCs	2-Methylnapthalene	2/3	67%	2,507	2,200	40 - 40	3300 - 4200	652.0	8.0E+03	2.6E+41	Max Used	4,200	µg/Kg
SVOCs	Acenaphthene	1/3	33%	132.5	197.0	35 - 40	360 - 360	50.1	6.2E+02	1.1E+14	Max Used	360	µg/Kg
SVOCs	Anthracene	2/3	67%	86.7	58.6	40 - 40	110 - 130	65.9	2.3E+02	2.3E+06	Max Used	130	µg/Kg
SVOCs	Benzo(a)anthracene	2/3	67%	163.3	125.0	40 - 40	220 - 250	103.2	4.7E+02	3.8E+10	Max Used	250	µg/Kg
SVOCs	Benzo(a)pyrene	1/3	33%	44.8	45.2	35 - 40	97 - 97	32.4	1.6E+02	2.2E+05	Max Used	97	µg/Kg
SVOCs	Benzo(b)fluoranthene	1/3	33%	75.8	98.9	35 - 40	190 - 190	40.5	3.2E+02	1.6E+09	Max Used	190	µg/Kg
SVOCs	Benzo(g,h,i)perylene	1/3	33%	39.8	36.5	35 - 40	82 - 82	30.6	1.3E+02	3.8E+04	Max Used	82	µg/Kg
SVOCs	bis(2-Ethylhexyl)phthalate	2/3	67%	496.7	618.1	80 - 80	250 - 1200	228.9	2.0E+03	4.2E+14	Max Used	1,200	µg/Kg
SVOCs	Chrysene	1/3	33%	75.8	98.9	35 - 40	190 - 190	40.5	3.2E+02	1.6E+09	Max Used	190	µg/Kg
SVOCs	Fluoranthene	3/3	100%	274.7	262.3	---	44 - 560	175.7	9.3E+02	1.8E+09	Max Used	560	µg/Kg
SVOCs	Fluorene	2/3	67%	330.0	281.6	40 - 40	400 - 570	165.8	1.0E+03	3.5E+16	Max Used	570	µg/Kg
SVOCs	Indeno(1,2,3-cd)pyrene	1/3	33%	41.2	38.8	35 - 40	86 - 86	31.1	1.4E+02	6.1E+04	Max Used	86	µg/Kg
SVOCs	Naphthalene	2/3	67%	1,687	2,140	40 - 40	940 - 4100	425.6	7.0E+03	4.0E+34	Max Used	4,100	µg/Kg
SVOCs	Phenanthrene	2/3	67%	1,173	1,030	40 - 40	1500 - 2000	391.5	3.7E+03	5.8E+30	Max Used	2,000	µg/Kg
SVOCs	Pyrene	3/3	100%	437.3	486.8	---	72 - 990	261.2	1.6E+03	4.9E+09	Max Used	990	µg/Kg
VOCs	1,2,4-Trichlorobenzene	2/3	67%	523.3	608.8	40 - 40	350 - 1200	203.3	2.0E+03	9.5E+20	Max Used	1200	µg/Kg
VOCs	1,2-Dichlorobenzene	1/3	33%	44.5	44.6	35 - 40	96 - 96	32.3	1.6E+02	2.0E+05	Max Used	96	µg/Kg
VOCs	1,3-Dichlorobenzene	1/3	33%	33.2	25.0	35 - 40	62 - 62	27.9	9.5E+01	3.0E+03	Max Used	62	µg/Kg
VOCs	1,4-Dichlorobenzene	1/3	33%	69.2	87.3	35 - 40	170 - 170	39.0	2.9E+02	3.0E+08	Max Used	170	µg/Kg
VOCs	Ethylbenzene	1/1	100%	25,000		---	25000 - 25000	25,000			Max Used	25,000	µg/Kg
VOCs	Toluene	1/1	100%	2,400		---	2400 - 2400	2,400			Max Used	2,400	µg/Kg
VOCs	Xylenes (Total)	1/1	100%	73,000		---	73000 - 73000	73,000			Max Used	73,000	µg/Kg

Note:
Only those chemicals with a frequency of detection greater than 5% were included in the J&E Model runs.
Only soils that corresponded to 0-6 ft depth interval were included in these calculations.
95UCL-H can not be calculated for sample sizes less than 3.

Table A-4. Johnson & Ettinger Model - Summary of Concentrations of Ground Water (Water Table) Samples Located in Soil Hot Spot 1 (Soil AOC-1)

ChemClass	Analyte	Freq	Freq%	Mean	StdDev	ND Range	Pos Range	GeoMean	95UCL-T	95UCL_H	Comment	95UCL Value	Units
SVOCs	2-Methylnapthalene	1/1	100%	18		---	18 - 18	18	---	---	Max Value Used	18	µg/L
SVOCs	4-Chloroaniline	1/1	100%	2,250		---	2250 - 2250	2250	---	---	Max Value Used	2,250	µg/L
SVOCs	4-Methyl-2-pentanone	1/1	100%	270		---	270 - 270	270	---	---	Max Value Used	270	µg/L
SVOCs	Acenaphthene	1/1	100%	1		---	1 - 1	1	---	---	Max Value Used	1	µg/L
SVOCs	bis(2-Chloroethyl)ether	1/1	100%	26		---	26 - 26	26	---	---	Max Value Used	26	µg/L
SVOCs	Butyl benzyl phthalate	1/1	100%	2		---	2 - 2	2	---	---	Max Value Used	2	µg/L
SVOCs	Diethyl phthalate	1/1	100%	2		---	2 - 2	2	---	---	Max Value Used	2	µg/L
SVOCs	Isophorone	1/1	100%	27		---	27 - 27	27	---	---	Max Value Used	27	µg/L
SVOCs	Naphthalene	1/1	100%	82.5		---	82.5 - 82.5	82.5	---	---	Max Value Used	82.5	µg/L
SVOCs	Phenanthrene	1/1	100%	1.5		---	1.5 - 1.5	1.5	---	---	Max Value Used	1.5	µg/L
VOCs	1,1,1-Trichloroethane	1/1	100%	170		---	170 - 170	170	---	---	Max Value Used	170	µg/L
VOCs	1,1-Dichloroethane	1/1	100%	310		---	310 - 310	310	---	---	Max Value Used	310	µg/L
VOCs	1,2,4-Trichlorobenzene	1/1	100%	1.5		---	1.5 - 1.5	1.5	---	---	Max Value Used	1.5	µg/L
VOCs	1,2-Dichlorobenzene	1/1	100%	18		---	18 - 18	18	---	---	Max Value Used	18	µg/L
VOCs	1,2-Dichloroethane	1/1	100%	96		---	96 - 96	96	---	---	Max Value Used	96	µg/L
VOCs	1,4-Dichlorobenzene	1/1	100%	1.5		---	1.5 - 1.5	1.5	---	---	Max Value Used	1.5	µg/L
VOCs	Acetone	1/1	100%	175		---	175 - 175	175	---	---	Max Value Used	175	µg/L
VOCs	Benzene	1/1	100%	915		---	915 - 915	915	---	---	Max Value Used	915	µg/L
VOCs	Chlorobenzene	1/1	100%	40.5		---	40.5 - 40.5	40.5	---	---	Max Value Used	40.5	µg/L
VOCs	Chloroform	1/1	100%	98.5		---	98.5 - 98.5	98.5	---	---	Max Value Used	98.5	µg/L
VOCs	cis-1,2-Dichloroethene	1/1	100%	16,500		---	16500 - 16500	16500	---	---	Max Value Used	16,500	µg/L
VOCs	Ethylbenzene	1/1	100%	655		---	655 - 655	655	---	---	Max Value Used	655	µg/L
VOCs	Toluene	1/1	100%	2,500		---	2500 - 2500	2500	---	---	Max Value Used	2,500	µg/L
VOCs	trans-1,2-Dichloroethene	1/1	100%	78		---	78 - 78	78	---	---	Max Value Used	78	µg/L
VOCs	Trichloroethene	1/1	100%	590		---	590 - 590	590	---	---	Max Value Used	590	µg/L
VOCs	Vinyl chloride	1/1	100%	240		---	240 - 240	240	---	---	Max Value Used	240	µg/L
VOCs	Xylenes (Total)	1/1	100%	3,000		---	3000 - 3000	3000	---	---	Max Value Used	3,000	µg/L

Note:
Only those chemicals with a frequency of detection greater than 5% were included in the J&E Model runs.
95UCL-H can not be calculated for sample sizes less than 3.

Table A-5. Johnson & Ettinger Model - Summary of Concentrations of Soil Samples Located in Soil Hot Spot 1 (Soil AOC-1)

Chem Class	Analyte	Freq	Freq%	Mean	StdDev	ND Range	Pos Range	GeoMean	95UCL-T	95UCL_H	Comment	95UCL Value	Conc Units
PCBs	Aroclor-1248	1/3	33%	980	1,689	9 - 9.9	2930 - 2930	40.3	5.2E+03	9.4E+59	Max Used	2,930	µg/Kg
PCBs	Aroclor-1260	3/3	100%	2,732	4,675	---	4.8 - 8130	134.2	1.4E+04	3.3E+62	Max Used	8,130	µg/Kg
PCBs	Total PCBs	3/3	100%	3,709	6,366	---	11060	148.8	2.0E+04	1.1E+68	Max Used	11,060	µg/Kg
SVOCs	2,4-Dimethylphenol	1/3	33%	960	1594	76 - 83	2800 - 2800	164.1	4.9E+03	6.0E+27	Max Used	2,800	µg/Kg
SVOCs	2-Methylnapthalene	1/3	33%	9,013	15,577	38 - 42	27000 - 27000	220.9	4.8E+04	4.9E+75	Max Used	27,000	µg/Kg
SVOCs	2-Methylphenol	1/3	33%	273	439	38 - 42	780 - 780	67.8	1.4E+03	6.1E+20	Max Used	780	µg/Kg
SVOCs	4-Methylphenol	1/3	33%	760	1247	76 - 83	2200 - 2200	151.4	3.9E+03	8.4E+24	Max Used	2,200	µg/Kg
SVOCs	Acenaphthene	1/3	33%	413	681	38 - 42	1200 - 1200	78.2	2.1E+03	3.7E+25	Max Used	1,200	µg/Kg
SVOCs	Acenaphthylene	1/3	33%	147	219	38 - 42	400 - 400	54.2	6.9E+02	2.6E+14	Max Used	400	µg/Kg
SVOCs	Anthracene	1/3	33%	283	456	38 - 42	810 - 810	68.6	1.4E+03	1.5E+21	Max Used	810	µg/Kg
SVOCs	Benzo(a)anthracene	2/3	67%	193	243	38 - 38	89 - 470	92.6	8.0E+02	7.2E+12	Max Used	470	µg/Kg
SVOCs	Benzo(a)pyrene	1/3	33%	95	87	38 - 380	77 - 77	65.3	3.1E+02	3.2E+07	Max Used	77	µg/Kg
SVOCs	Benzo(b)fluoranthene	1/3	33%	106	86	38 - 380	110 - 110	73.5	3.2E+02	9.7E+07	Max Used	110	µg/Kg
SVOCs	Benzo(g,h,i)perylene	1/3	33%	85	92	38 - 380	46 - 46	55.0	3.1E+02	2.8E+07	Max Used	46	µg/Kg
SVOCs	Benzo(k)fluoranthene	1/3	33%	86	91	38 - 380	49 - 49	56.1	3.1E+02	2.6E+07	Max Used	49	µg/Kg
SVOCs	bis(2-Ethylhexyl)phthalate	2/3	67%	1,423	2,319	76 - 76	130 - 4100	272.6	7.2E+03	2.3E+27	Max Used	4,100	µg/Kg
SVOCs	Butyl benzyl phthalate	1/3	33%	293	439	76 - 83	800 - 800	108.1	1.4E+03	5.7E+14	Max Used	800	µg/Kg
SVOCs	Chrysene	2/3	67%	239	331	38 - 38	79 - 620	97.6	1.1E+03	9.5E+14	Max Used	620	µg/Kg
SVOCs	Dibenzofuran	1/3	33%	303	491	38 - 42	870 - 870	70.3	1.5E+03	8.9E+21	Max Used	870	µg/Kg
SVOCs	Fluoranthene	2/3	67%	353	502	38 - 38	110 - 930	124.8	1.6E+03	1.4E+18	Max Used	930	µg/Kg
SVOCs	Fluorene	1/3	33%	713	1201	38 - 42	2100 - 2100	94.3	3.7E+03	3.6E+32	Max Used	2,100	µg/Kg
SVOCs	Indeno(1,2,3-cd)pyrene	1/3	33%	86	91	38 - 380	50 - 50	56.5	3.1E+02	2.5E+07	Max Used	50	µg/Kg
SVOCs	Isophorone	1/3	33%	8,013	13,845	38 - 42	24000 - 24000	212.4	4.2E+04	2.0E+73	Max Used	24,000	µg/Kg
SVOCs	Naphthalene	1/3	33%	6,347	10,958	38 - 42	19000 - 19000	196.4	3.4E+04	4.6E+68	Max Used	19,000	µg/Kg
SVOCs	n-Nitrosodiphenylamine	1/3	33%	1,047	1,778	38 - 42	3100 - 3100	107.3	5.5E+03	8.9E+37	Max Used	3,100	µg/Kg
SVOCs	Phenanthrene	2/3	67%	2,423	4,137	38 - 38	51 - 7200	191.1	1.3E+04	1.3E+45	Max Used	7,200	µg/Kg
SVOCs	Phenol	1/3	33%	760	1,247	76 - 83	2200 - 2200	151.4	3.9E+03	8.4E+24	Max Used	2,200	µg/Kg
SVOCs	Pyrene	2/3	67%	1,069	1,759	38 - 38	88 - 3100	173.1	5.4E+03	1.4E+31	Max Used	3,100	µg/Kg
VOCs	1,2,4-Trichlorobenzene	1/3	33%	647	1,085	38 - 42	1900 - 1900	91.2	3.3E+03	1.8E+31	Max Used	1,900	µg/Kg
VOCs	1,2-Dichlorobenzene	1/3	33%	2,447	4,203	38 - 42	7300 - 7300	142.8	1.3E+04	2.0E+51	Max Used	7,300	µg/Kg
VOCs	1,4-Dichlorobenzene	1/3	33%	153	231	38 - 42	420 - 420	55.1	7.3E+02	6.8E+14	Max Used	420	µg/Kg

Note:
Only those chemicals with a frequency of detection greater than 5% were included in the J&E Model runs.
Only soils that corresponded to 0-6 ft depth interval were included in these calculations.
95UCL-H can not be calculated for sample sizes less than 3.

Table A-6. Johnson & Ettinger Model - Summary of Concentrations of Ground Water (Water Table) Samples Located near the West Side Property (Soil AOC-5)

ChemClass	Analyte	Freq	Freq%	Mean	StdDev	ND Range	Pos Range	GeoMean	95UCL-T	95UCL-H	Comment	95UCL Value	Conc Units
PCBs	Aroclor-1242	2/2	100%	38.3	50.5	---	2.6 - 74	13.9	4.9E+02		Max Value Used	74	µg/L
PCBs	Aroclor-1260	2/2	100%	101.0	125.9	---	12 - 190	47.7	1.2E+03		Max Value Used	190	µg/L
PCBs	Total PCBs	2/2	100%	139.3	176.4	---	264	62.1	1.7E+03		Max Value Used	264	µg/L
SVOCs	2,4-Dimethylphenol	1/2	50%	75.3	105.7	1 - 1	150 - 150	8.7	1.0E+03		Max Value Used	150	µg/L
SVOCs	2-Methylnapthalene	1/4	25%	0.63	0.25	1 - 1	1 - 1	0.6	1.0E+00	1.1E+00	Max Value Used	1	µg/L
SVOCs	2-Methylphenol	1/2	50%	0.75	0.35	1 - 1	1 - 1	0.7	3.9E+00		Max Value Used	1	µg/L
SVOCs	4-Chloro-3-methylphenol	1/2	50%	0.75	0.35	1 - 1	1 - 1	0.7	3.9E+00		Max Value Used	1	µg/L
SVOCs	4-Methylphenol	1/2	50%	4.75	4.60	3 - 3	8 - 8	3.5	4.6E+01		Max Value Used	8	µg/L
SVOCs	Acenaphthene	1/4	25%	0.63	0.25	1 - 1	1 - 1	0.6	1.0E+00	1.1E+00	Max Value Used	1	µg/L
SVOCs	bis(2-Ethylhexyl)phthalate	2/4	50%	3.75	4.27	2 - 2	3 - 10	2.3	1.1E+01	4.4E+02	Max Value Used	10	µg/L
SVOCs	Chrysene	1/4	25%	0.63	0.25	1 - 1	1 - 1	0.6	1.0E+00	1.1E+00	Max Value Used	1	µg/L
SVOCs	Di-n-octyl phthalate	1/4	25%	1.25	0.50	2 - 2	2 - 2	1.2	2.0E+00	2.3E+00	Max Value Used	2	µg/L
SVOCs	Fluoranthene	1/4	25%	0.63	0.25	1 - 1	1 - 1	0.6	1.0E+00	1.1E+00	Max Value Used	1	µg/L
SVOCs	Fluorene	2/4	50%	1.25	1.19	1 - 1	1 - 3	0.9	3.1E+00	2.2E+01	Max Value Used	3	µg/L
SVOCs	Naphthalene	1/4	25%	0.88	0.75	1 - 1	2 - 2	0.7	2.1E+00	6.0E+00	Max Value Used	2	µg/L
SVOCs	n-Nitrosodiphenylamine	3/4	75%	2.63	2.50	1 - 1	1 - 6	1.7	6.6E+00	3.6E+02	Max Value Used	6	µg/L
SVOCs	Phenanthrene	1/4	25%	1.63	2.25	1 - 1	5 - 5	0.9	5.2E+00	2.8E+02	Max Value Used	5	µg/L
SVOCs	Phenol	1/2	50%	1.25	1.06	1 - 1	2 - 2	1.0	1.1E+01		Max Value Used	2	µg/L
SVOCs	Pyrene	2/4	50%	1.25	1.19	1 - 1	1 - 3	0.9	3.1E+00	2.2E+01	Max Value Used	3	µg/L
VOCs	1,1-Dichloroethane	1/4	25%	1.63	1.11	1 - 4	3 - 3	1.3	3.4E+00	2.0E+01	Max Value Used	3	µg/L
VOCs	1,2,4-Trichlorobenzene	4/4	100%	3.63	1.60	---	2 - 5	3.3	6.2E+00	9.8E+00	Max Value Used	5	µg/L
VOCs	1,2-Dichlorobenzene	2/4	50%	1.25	0.87	1 - 1	2 - 2	1.0	2.6E+00	1.7E+01	Max Value Used	2	µg/L
VOCs	1,3-Dichlorobenzene	1/4	25%	0.63	0.25	1 - 1	1 - 1	0.6	1.0E+00	1.1E+00	Max Value Used	1	µg/L
VOCs	1,4-Dichlorobenzene	1/4	25%	0.88	0.75	1 - 1	2 - 2	0.7	2.1E+00	6.0E+00	Max Value Used	2	µg/L
VOCs	Acetone	1/4	25%	6.50	5.20	6 - 12	14 - 14	5.2	1.5E+01	5.7E+01	Max Value Used	14	µg/L
VOCs	Benzene	4/4	100%	13.8	14.2	---	1 - 26	6.1	3.6E+01	1.6E+06	Max Value Used	26	µg/L
VOCs	Chloroethane	1/4	25%	1.88	0.85	2 - 6	2 - 2	1.7	3.2E+00	4.9E+00	Max Value Used	2	µg/L
VOCs	cis-1,2-Dichloroethene	2/4	50%	1.63	1.60	1 - 2	1 - 4	1.2	4.2E+00	3.3E+01	Max Value Used	4	µg/L
VOCs	Ethylbenzene	2/4	50%	5.00	7.35	2 - 4	1 - 16	2.4	1.7E+01	4.0E+03	Max Value Used	16	µg/L
VOCs	Tetrachloroethene	2/4	50%	1.25	1.19	1 - 1	1 - 3	0.9	3.1E+00	2.2E+01	Max Value Used	3	µg/L
VOCs	Toluene	1/4	25%	1.38	0.75	1 - 4	2 - 2	1.2	2.6E+00	8.6E+00	Max Value Used	2	µg/L
VOCs	Trichloroethene	1/4	25%	1.13	1.25	1 - 1	3 - 3	0.8	3.1E+00	2.6E+01	Max Value Used	3	µg/L
VOCs	Vinyl chloride	1/4	25%	1.13	0.63	1 - 4	1 - 1	1.0	2.1E+00	4.4E+00	Max Value Used	1	µg/L
VOCs	Xylenes (Total)	4/4	100%	11.3	14.8	---	1 - 33	5.3	3.5E+01	7.0E+04	Max Value Used	33	µg/L

Note:
Only those chemicals with a frequency of detection greater than 5% were included in the J&E Model runs.
95UCL-H can not be calculated for sample sizes less than 3.

800293

Table A-7. Johnson & Ettinger Model - Summary of Concentrations of Soil Samples Located near the West Side Property (Soil AOC-5)

Chem Class	Analyte	Freq	Freq%	Mean	StdDev	ND Range	Pos Range	GeoMean	95UCL-T	95UCL_H	Comment	95UCL Value	Conc Units
PCBs	Aroclor-1260	1/1	100%	36	---	---	36 - 36	36	---	---	Max Used	36	µg/Kg
PCBs	Total PCBs	1/1	100%	36	---	---	36 - 36	36	---	---	Max Used	36	µg/Kg
VOCs	Xylenes (Total)	1/1	100%	2	---	---	4.8 - 8130	2	---	---	Max Used	2	µg/Kg
SVOCs	bis(2-Ethylhexyl)phthalate	1/1	100%	97	---	---	11060	97	---	---	Max Used	97	µg/Kg

Note:
Only those chemicals with a frequency of detection greater than 5% were included in the J&E Model runs.
Only soils that corresponded to 0-6 ft depth interval were included in these calculations.
95UCL-H can not be calculated for sample sizes less than 3.

Table A-8. Johnson & Ettinger Model - Summary of Concentrations of Ground Water (Water Table) Samples Located near the South Side Property (Soil AOC-4)

Chem Class	Analyte	Freq	Freq%	Mean	StdDev	ND Range	Pos Range	GeoMean	95UCL-T	95UCL_H	Comment	95UCL Value	Units
SVOCs	Acenaphthene	1/5	20%	0.8	0.7	1 - 1	2 - 2	0.7	1.6E+00	2.3E+00	Max Value Used	2.0	µg/L
SVOCs	bis(2-Chloroethyl)ether	2/6	33%	59.8	142.2	1 - 1	7 - 350	2.3	2.1E+02	1.7E+07	Max Value Used	350.0	µg/L
SVOCs	bis(2-Ethylhexyl)phthalate	1/5	20%	1.6	1.3	2 - 2	4 - 4	1.3	3.3E+00	4.5E+00	Max Value Used	4.0	µg/L
SVOCs	Dibenzofuran	1/5	20%	0.6	0.2	1 - 1	1 - 1	0.6	8.8E-01	8.8E-01	H-UCL Used	0.9	µg/L
SVOCs	Fluoranthene	1/5	20%	1.2	1.6	1 - 1	4 - 4	0.8	3.1E+00	9.9E+00	Max Value Used	4.0	µg/L
SVOCs	Fluorene	1/5	20%	0.8	0.7	1 - 1	2 - 2	0.7	1.6E+00	2.3E+00	Max Value Used	2.0	µg/L
SVOCs	Phenanthrene	1/5	20%	2.2	3.8	1 - 1	9 - 9	0.9	6.9E+00	1.1E+02	Max Value Used	9.0	µg/L
SVOCs	Pyrene	1/5	20%	1.0	1.1	1 - 1	3 - 3	0.7	2.4E+00	5.0E+00	Max Value Used	3.0	µg/L
VOCs	1,2-Dichloroethane	2/8	25%	2.0	2.2	1 - 2	5 - 6	1.3	3.8E+00	6.5E+00	Max Value Used	6.0	µg/L
VOCs	Benzene	2/8	25%	1.3	1.4	1 - 1	3 - 4	0.8	2.4E+00	3.6E+00	H-UCL Used	3.6	µg/L

Note:
Only those chemicals with a frequency of detection greater than 5% were included in the J&E Model runs.
95UCL-H can not be calculated for sample sizes less than 3.

Table A-9. Johnson & Ettinger Model - Summary of Concentrations of Soil Samples Located near the South Side Property (Soil AOC-4)

Chem Class	Analyte	Freq	Freq%	Mean	StdDev	ND Range	Pos Range	GeoMean	95UCL-T	95UCL_H	Comment	95UCL Value	Conc Units
PCBs	Aroclor-1260	1/1	100%	38	---	---	38 - 38	38	---	---	Max Used	38	µg/Kg
PCBs	Total PCBs	1/1	100%	38	---	---	38 - 38	38	---	---	Max Used	38	µg/Kg
SVOCs	Pyrene	1/1	100%	14	---	---	14 - 14	14	---	---	Max Used	14	µg/Kg

Note:
Only those chemicals with a frequency of detection greater than 5% were included in the J&E Model runs.
Only soils that corresponded to 0-6 ft depth interval were included in these calculations.
95UCL-H can not be calculated for sample sizes less than 3.

Table A-10A. Johnson & Ettinger Model - Summary of Concentrations of Ground Water (Water Table) Samples Located in the Remainder of the BROS Property (Excludes Former Lagoon Area)

Chem Class	Analyte	Freq	Freq%	Mean	StdDev	ND Range	Pos Range	GeoMean	95UCL-T	95UCL-H	Comment	95UCL Value	Units
PCBs	Aroclor-1242	3/3	100%	0.26	0.21	---	0.14 - 0.5	0.22	0.77	3.2E+01	Max Value Used	0.50	µg/L
PCBs	Aroclor-1260	2/3	67%	0.28	0.21	0.1 - 0.1	0.32 - 0.47	0.20	0.81	2.3E+05	Max Value Used	0.47	µg/L
PCBs	Total PCBs	3/3	100%	0.53	0.41	0.1 - 0.1	0.15 - 97	0.41	5.13	---	Max Value Used	0.97	µg/L
SVOCs	2,4-DIMETHYLPHENOL	1/3	33%	0.67	0.29	1 - 1	1 - 1	0.63	1.38	3.0E+00	Max Value Used	1.00	µg/L
SVOCs	2-Methylnapthalene	2/6	33%	0.66	0.27	0.9 - 1	1 - 1	0.62	0.94	9.9E-01	H-UCL Used	0.99	µg/L
SVOCs	3-Nitroaniline	2/6	33%	1.50	0.84	2 - 2	2 - 3	1.35	2.38	2.6E+00	H-UCL Used	2.64	µg/L
SVOCs	Acenaphthene	1/6	17%	1.41	2.25	0.9 - 1	6 - 6	0.74	3.77	8.6E+00	Max Value Used	6.00	µg/L
SVOCs	bis(2-Chloroethyl)ether	2/6	33%	7.50	15.05	1 - 1	5 - 38	1.51	23.29	2.6E+03	Max Value Used	38.00	µg/L
SVOCs	bis(2-Ethylhexyl)phthalate	1/6	17%	1.33	0.82	2 - 2	3 - 3	1.20	2.19	2.2E+00	H-UCL Used	2.20	µg/L
SVOCs	Fluorene	2/6	33%	0.67	0.26	1 - 1	1 - 1	0.63	0.94	9.8E-01	H-UCL Used	0.98	µg/L
SVOCs	Naphthalene	3/7	43%	5.71	7.78	0.9 - 1	7 - 21	1.88	12.90	4.9E+02	Max Value Used	21.00	µg/L
SVOCs	n-Nitrosodiphenylamine	1/6	17%	1.57	2.66	0.9 - 1	7 - 7	0.76	4.36	1.2E+01	Max Value Used	7.00	µg/L
VOCs	1,1-Dichloroethane	2/12	17%	2.00	3.30	1 - 2	8 - 10	0.91	4.10	4.7E+00	H-UCL Used	4.68	µg/L
VOCs	1,2-Dichlorobenzene	4/6	67%	4.00	5.32	1 - 1	1 - 14	1.86	9.58	1.3E+02	Max Value Used	14.00	µg/L
VOCs	1,4-Dichlorobenzene	1/6	17%	0.74	0.62	0.9 - 1	2 - 2	0.62	1.39	1.5E+00	H-UCL Used	1.52	µg/L
VOCs	2-Butanone	1/12	8%	1.88	1.30	3 - 3	6 - 6	1.68	2.70	2.3E+00	H-UCL Used	2.33	µg/L
VOCs	Acetone	2/12	17%	10.00	18.63	6 - 26	12 - 68	4.94	21.84	1.9E+01	H-UCL Used	19.25	µg/L
VOCs	Benzene	8/12	67%	8.58	10.80	1 - 1	1 - 37	3.18	15.45	1.0E+02	Max Value Used	37.00	µg/L
VOCs	Chlorobenzene	2/12	17%	23.92	80.65	1 - 1	2 - 280	0.95	75.16	6.5E+01	H-UCL Used	65.18	µg/L
VOCs	Chloroethane	1/12	8%	1.38	0.86	2 - 3	4 - 4	1.24	1.92	1.7E+00	H-UCL Used	1.74	µg/L
VOCs	cis-1,2-Dichloroethene	1/12	8%	0.79	0.72	1 - 2	3 - 3	0.65	1.25	1.1E+00	H-UCL Used	1.09	µg/L
VOCs	Ethylbenzene	4/12	33%	16.79	54.55	1 - 2	2 - 190	1.27	51.45	5.2E+01	H-UCL Used	52.45	µg/L
VOCs	Toluene	6/12	50%	10.00	23.42	1 - 2	2 - 83	2.26	24.88	6.6E+01	H-UCL Used	66.32	µg/L
VOCs	Xylenes (Total)	7/12	58%	25.54	58.99	1 - 1	2 - 210	3.88	63.02	1.0E+03	Max Value Used	210.00	µg/L

Note:
Only those chemicals with a frequency of detection greater than 5% were included in the J&E Model runs.
The well that represented the Former Lagoon Area was MW-26S.
95UCL-H can not be calculated for sample sizes less than 3.

Table A-10B. Johnson & Ettinger Model - Summary of Concentrations of Groundwater (Water Table) Samples Located in the Former Lagoon Area Subarea of the Rest of BROS Property

Chem Class	Analyte	Freq	Freq%	Mean	StdDev	ND Range	Pos Range	GeoMean	95UCL-T	95UCL-H	Comment	95UCL Value	Units
SVOCs	2-Methylnapthalene	1/1	100%	120		---	120 - 120	120.0	---	---	Max Value Used	1.20E+02	µg/L
SVOCs	4-Methyl-2-pentanone	2/2	100%	585	332	---	350 - 820	535.7	3571	---	Max Value Used	8.20E+02	µg/L
SVOCs	Acenaphthene	1/1	100%	3.0		---	3 - 3	3.0	---	---	Max Value Used	3.00E+00	µg/L
SVOCs	Acenaphthylene	1/1	100%	12		---	12 - 12	12.0	---	---	Max Value Used	1.20E+01	µg/L
SVOCs	Anthracene	1/1	100%	7.0		---	7 - 7	7.0	---	---	Max Value Used	7.00E+00	µg/L
SVOCs	Benzo(a)anthracene	1/1	100%	3.0		---	3 - 3	3.0	---	---	Max Value Used	3.00E+00	µg/L
SVOCs	Benzo(a)pyrene	1/1	100%	3.0		---	3 - 3	3.0	---	---	Max Value Used	3.00E+00	µg/L
SVOCs	Benzo(b)fluoranthene	1/1	100%	2.0		---	2 - 2	2.0	---	---	Max Value Used	2.00E+00	µg/L
SVOCs	Benzo(g,h,i)perylene	1/1	100%	2.0		---	2 - 2	2.0	---	---	Max Value Used	2.00E+00	µg/L
SVOCs	bis(2-Chloroethyl)ether	2/2	100%	931	1229	---	62 - 1800	334.1	11973	---	Max Value Used	1.80E+03	µg/L
SVOCs	bis(2-Ethylhexyl)phthalate	1/1	100%	18		---	18 - 18	18.0	---	---	Max Value Used	1.80E+01	µg/L
SVOCs	Butyl benzyl phthalate	1/1	100%	14		---	14 - 14	14.0	---	---	Max Value Used	1.40E+01	µg/L
SVOCs	Chrysene	1/1	100%	4		---	4 - 4	4.0	---	---	Max Value Used	4.00E+00	µg/L
SVOCs	Dibenzofuran	1/1	100%	3.0		---	3 - 3	3.0	---	---	Max Value Used	3.00E+00	µg/L
SVOCs	Di-n-butyl phthalate	1/1	100%	3.0		---	3 - 3	3.0	---	---	Max Value Used	3.00E+00	µg/L
SVOCs	Fluoranthene	1/1	100%	8.0		---	8 - 8	8.0	---	---	Max Value Used	8.00E+00	µg/L
SVOCs	Fluorene	1/1	100%	12.0		---	12 - 12	12.0	---	---	Max Value Used	1.20E+01	µg/L
SVOCs	Indeno(1,2,3-cd)pyrene	1/1	100%	1.0		---	1 - 1	1.0	---	---	Max Value Used	1.00E+00	µg/L
SVOCs	Isophorone	1/1	100%	390		---	390 - 390	390.0	---	---	Max Value Used	3.90E+02	µg/L
SVOCs	Naphthalene	3/3	100%	220	62	---	170 - 290	214.4	375	474	Max Value Used	2.90E+02	µg/L
SVOCs	Phenanthrene	1/1	100%	36		---	36 - 36	36.0	---	---	Max Value Used	3.60E+01	µg/L
SVOCs	Phenol	1/1	100%	570		---	570 - 570	570.0	---	---	Max Value Used	5.70E+02	µg/L
SVOCs	Pyrene	1/1	100%	11		---	11 - 11	11.0	---	---	Max Value Used	1.10E+01	µg/L
VOCs	1,1,1-Trichloroethane	2/2	100%	62.5	16	---	51 - 74	61.4	209	---	Max Value Used	7.40E+01	µg/L
VOCs	1,1,2-Trichloroethane	1/2	50%	4	1.4	10 - 10	3 - 3	3.9	16.7	---	Max Value Used	3.00E+00	µg/L
VOCs	1,1-Dichloroethane	2/2	100%	92.5	0.7	---	92 - 93	92.5	98.9	---	Max Value Used	9.30E+01	µg/L
VOCs	1,1-Dichloroethene	1/2	50%	3.75	1.8	5 - 5	5 - 5	3.5	19.6	---	Max Value Used	5.00E+00	µg/L
VOCs	1,2,4-Trichlorobenzene	1/1	100%	6.0		---	6 - 6	6.0	---	---	Max Value Used	6.00E+00	µg/L
VOCs	1,2-Dichlorobenzene	1/1	100%	8.0		---	8 - 8	8.0	---	---	Max Value Used	8.00E+00	µg/L
VOCs	1,2-Dichloroethane	2/2	100%	145	7.1	---	140 - 150	144.9	209	---	Max Value Used	1.50E+02	µg/L
VOCs	1,2-Dichloropropane	2/2	100%	8.5	2.1	---	7 - 10	8.4	27.6	---	Max Value Used	1.00E+01	µg/L
VOCs	1,4-Dichlorobenzene	1/1	100%	1.0		---	1 - 1	1.0	---	---	Max Value Used	1.00E+00	µg/L
VOCs	2-Butanone	2/2	100%	905	559	---	510 - 1300	814.2	5924	---	Max Value Used	1.30E+03	µg/L
VOCs	2-Hexanone	2/2	100%	41	28	---	21 - 61	35.8	295	---	Max Value Used	6.10E+01	µg/L
VOCs	Acetone	2/2	100%	4500	2970	---	2400 - 6600	3979.9	31183	---	Max Value Used	6.60E+03	µg/L
VOCs	Benzene	2/2	100%	340	85	---	280 - 400	334.7	1102	---	Max Value Used	4.00E+02	µg/L
VOCs	Carbon disulfide	2/2	100%	130	0.0	---	130 - 130	130.0	130	---	Max Value Used	1.30E+02	µg/L
VOCs	Chlorobenzene	1/2	50%	3.25	1.1	5 - 5	4 - 4	3.2	12.8	---	Max Value Used	4.00E+00	µg/L
VOCs	Chloroethane	2/2	100%	76.5	24.7	---	59 - 94	74.5	299	---	Max Value Used	9.40E+01	µg/L
VOCs	Chloroform	2/2	100%	17.5	3.5	---	15 - 20	17.3	49.3	---	Max Value Used	2.00E+01	µg/L
VOCs	Chloromethane	1/2	50%	6.75	1.1	15 - 15	6 - 6	6.7	16.3	---	Max Value Used	6.00E+00	µg/L
VOCs	cis-1,2-Dichloroethene	2/2	100%	420	0.0	---	420 - 420	420.0	420	---	Max Value Used	4.20E+02	µg/L
VOCs	Ethylbenzene	2/2	100%	61.5	3.5	---	59 - 64	61.4	93.3	---	Max Value Used	6.40E+01	µg/L
VOCs	Methylene chloride	2/2	100%	240	99	---	170 - 310	229.6	1129	---	Max Value Used	3.10E+02	µg/L
VOCs	Tetrachloroethene	2/2	100%	33.5	2.1	---	32 - 35	33.5	52.6	---	Max Value Used	3.50E+01	µg/L

Table A-10B. Johnson & Ettinger Model - Summary of Concentrations of Groundwater (Water Table) Samples Located in the Former Lagoon Area Subarea of the Rest of BROS Property

Chem Class	Analyte	Freq	Freq%	Mean	StdDev	ND Range	Pos Range	GeoMean	95UCL-T	95UCL-H	Comment	95UCL Value	Units
VOCs	Toluene	2/2	100%	630	156	---	520 - 740	620.3	2028	---	Max Value Used	7.40E+02	µg/L
VOCs	trans-1,2-Dichloroethene	1/2	50%	4.0	1.4	10 - 10	3 - 3	3.9	16.7	---	Max Value Used	3.00E+00	µg/L
VOCs	Trichloroethene	2/2	100%	490	85	---	430 - 550	486.3	1252	---	Max Value Used	5.50E+02	µg/L
VOCs	Vinyl chloride	2/2	100%	25.5	0.7	---	25 - 26	25.5	31.9	---	Max Value Used	2.60E+01	µg/L
VOCs	Xylenes (Total)	2/2	100%	270	57	---	230 - 310	267.0	778	---	Max Value Used	3.10E+02	µg/L

Note:
Only those chemicals with a frequency of detection greater than 5% were included in the J&E Model runs.
95UCL-H can not be calculated for sample sizes less than 3.

Table A-11. Johnson & Ettinger Model - Summary of Concentrations of Soil Samples Located in the Remainder of the BROS Property

Chem Class	Analyte	Freq	Freq%	Mean	StdDev	ND Range	Pos Range	GeoMean	95UCL-T	95UCL-H	Comment	95UCL Value	Conc Units
PCBs	Aroclor-1248	8/23	34.8%	369	705	3.4 - 420	20 - 2600	38.6	6.7E+02	8.1E+03	Max Used	2.6E+03	µg/Kg
PCBs	Aroclor-1254	9/23	39.1%	768	1,805	3.4 - 73	24 - 6000	28.8	1.5E+03	3.0E+04	Max Used	6.0E+03	µg/Kg
PCBs	Aroclor-1260	21/23	91.3%	655	1,029	3.9 - 360	7.1 - 3800	145.9	1.1E+03	7.6E+03	Max Used	3.8E+03	µg/Kg
SVOCs	2-Methylnapthalene	9/23	39.1%	991	2675	17 - 69	38 - 11000	59.7	2.1E+03	3.1E+03	H-UCL Used	3.1E+03	µg/Kg
SVOCs	4-Methylphenol	3/23	13.0%	44.7	24.5	34 - 140	14 - 110	39.6	5.5E+01	5.5E+01	H-UCL Used	5.5E+01	µg/Kg
SVOCs	Acenaphthene	8/23	34.8%	86.0	148.2	17 - 830	2 - 610	34.0	1.5E+02	1.9E+02	H-UCL Used	1.9E+02	µg/Kg
SVOCs	Acenaphthylene	5/23	21.7%	42.7	59.1	1 - 69	42 - 230	23.0	6.8E+01	9.7E+01	H-UCL Used	9.7E+01	µg/Kg
SVOCs	Anthracene	7/23	30.4%	47.2	51.2	1 - 69	51 - 190	27.0	6.9E+01	1.2E+02	H-UCL Used	1.2E+02	µg/Kg
SVOCs	Benzo(a)anthracene	9/23	39.1%	66.0	93.4	1 - 69	52 - 430	32.2	1.1E+02	1.9E+02	H-UCL Used	1.9E+02	µg/Kg
SVOCs	Benzo(a)pyrene	7/23	30.4%	55.7	80.3	1 - 69	38 - 340	27.5	9.0E+01	1.4E+02	H-UCL Used	1.4E+02	µg/Kg
SVOCs	Benzo(b)fluoranthene	11/23	47.8%	64.8	89.7	1 - 69	38 - 410	33.1	1.0E+02	1.9E+02	H-UCL Used	1.9E+02	µg/Kg
SVOCs	Benzo(g,h,i)perylene	8/23	34.8%	39.8	43.4	1 - 69	39 - 180	24.5	5.9E+01	9.5E+01	H-UCL Used	9.5E+01	µg/Kg
SVOCs	Benzo(k)fluoranthene	4/23	17.4%	29.5	35.5	1 - 69	40 - 180	19.5	4.5E+01	5.9E+01	H-UCL Used	5.9E+01	µg/Kg
SVOCs	bis(2-Ethylhexyl)phthalate	7/23	30.4%	194	312	2 - 140	93 - 1000	66.5	3.3E+02	6.6E+02	H-UCL Used	6.6E+02	µg/Kg
SVOCs	Butyl benzyl phthalate	2/23	8.7%	699	3,118	2 - 140	300 - 15000	44.5	2.0E+03	4.9E+02	H-UCL Used	4.9E+02	µg/Kg
SVOCs	Chrysene	11/23	47.8%	87.3	106.8	1 - 69	37 - 400	40.1	1.3E+02	3.3E+02	H-UCL Used	3.3E+02	µg/Kg
SVOCs	Dibenzofuran	7/23	30.4%	46.5	72.6	17 - 69	1 - 330	25.0	7.8E+01	8.8E+01	H-UCL Used	8.8E+01	µg/Kg
SVOCs	Diethyl phthalate	2/23	8.7%	61.2	106.7	2 - 140	120 - 540	36.0	1.1E+02	1.1E+02	H-UCL Used	1.1E+02	µg/Kg
SVOCs	Di-n-butyl phthalate	3/23	13.0%	134	374	2 - 140	82 - 1800	43.0	3.0E+02	2.2E+02	H-UCL Used	2.2E+02	µg/Kg
SVOCs	Fluoranthene	11/23	47.8%	139	220	1 - 69	57 - 800	46.6	2.3E+02	6.6E+02	H-UCL Used	6.6E+02	µg/Kg
SVOCs	Fluorene	9/23	39.1%	166	346	17 - 69	3 - 1500	43.1	3.2E+02	4.6E+02	H-UCL Used	4.6E+02	µg/Kg
SVOCs	Indeno(1,2,3-cd)pyrene	4/23	17.4%	35.5	48.2	1 - 69	44 - 220	20.8	5.6E+01	7.5E+01	H-UCL Used	7.5E+01	µg/Kg
SVOCs	Naphthalene	7/23	30.4%	298	749	17 - 69	46 - 2800	41.5	6.2E+02	5.2E+02	H-UCL Used	5.2E+02	µg/Kg
SVOCs	n-Nitrosodiphenylamine	2/23	8.7%	71.6	190.6	1 - 69	390 - 870	20.9	1.5E+02	1.2E+02	H-UCL Used	1.2E+02	µg/Kg
SVOCs	Phenanthrene	11/23	47.8%	427	901	17 - 69	9 - 4100	78.4	8.2E+02	2.5E+03	H-UCL Used	2.5E+03	µg/Kg
SVOCs	PHENOL	3/23	13.0%	43.1	25.2	34 - 140	2 - 120	35.3	5.4E+01	6.9E+01	H-UCL Used	6.9E+01	µg/Kg
SVOCs	Pyrene	13/23	56.5%	225	342	17 - 69	1 - 1500	65.6	3.7E+02	1.5E+03	H-UCL Used	1.5E+03	µg/Kg
VOCs	1,2,4-Trichlorobenzene	5/23	21.7%	73.3	202.1	17 - 69	3 - 980	25.0	1.6E+02	9.3E+01	H-UCL Used	9.3E+01	µg/Kg
VOCs	1,2-Dichlorobenzene	5/23	21.7%	150	440	17 - 69	5 - 2100	30.7	3.4E+02	2.2E+02	H-UCL Used	2.2E+02	µg/Kg
VOCs	1,4-Dichlorobenzene	3/23	13.0%	25.9	25.9	1 - 69	37 - 130	18.5	3.7E+01	5.0E+01	H-UCL Used	5.0E+01	µg/Kg
VOCs	2-Butanone	1/8	12.5%	217	221	3 - 950	39 - 39	57.4	4.0E+02	4.4E+05	Max Used	3.9E+01	µg/Kg
VOCs	Acetone	1/7	14.3%	380	348	6 - 1600	8 - 8	116.0	7.0E+02	2.7E+06	Max Used	8.0E+00	µg/Kg
VOCs	Benzene	1/8	12.5%	48.0	48.6	1 - 230	13 - 13	15.4	8.9E+01	2.0E+04	Max Used	1.3E+01	µg/Kg
VOCs	Carbon disulfide	1/7	14.3%	73.1	75.9	3 - 410	2 - 2	24.1	1.4E+02	6.9E+04	Max Used	2.0E+00	µg/Kg
VOCs	Chlorobenzene	2/8	25.0%	50.5	46.5	1 - 230	10 - 26	19.5	8.9E+01	1.4E+04	Max Used	2.6E+01	µg/Kg
VOCs	cis-1,2-Dichloroethene	1/7	14.3%	63.5	57.7	2 - 270	8 - 8	24.6	1.2E+02	2.7E+04	Max Used	8.0E+00	µg/Kg
VOCs	Ethylbenzene	2/7	28.6%	66.9	44.4	1 - 230	12 - 91	32.0	1.1E+02	5.4E+04	Max Used	9.1E+01	µg/Kg
VOCs	Methylene chloride	1/7	14.3%	107	101	2 - 470	9 - 9	33.9	2.0E+02	2.7E+05	Max Used	9.0E+00	µg/Kg
VOCs	Tetrachloroethene	1/8	12.5%	47.9	48.7	1 - 230	12 - 12	15.2	8.9E+01	2.0E+04	Max Used	1.2E+01	µg/Kg
VOCs	Toluene	2/7	28.6%	108	128	1 - 230	7 - 380	36.4	2.3E+02	4.2E+05	Max Used	3.8E+02	µg/Kg
VOCs	Trichloroethene	1/8	12.5%	48.0	48.6	1 - 230	13 - 13	15.4	8.9E+01	2.0E+04	Max Used	1.3E+01	µg/Kg
VOCs	Xylenes (Total)	3/7	42.9%	214	180	1 - 230	360 - 440	83.7	3.8E+02	3.0E+06	Max Used	4.4E+02	µg/Kg

Note:
Only those chemicals with a frequency of detection greater than 5% were included in the J&E Model runs.
Only soils that corresponded to 0-6 ft depth interval were included in these calculations.
95UCL-H can not be calculated for sample sizes less than 3.

Table A-12. Summary of Soil Property Parameters Used in the Johnson & Ettinger Model for All Evaluated Pathways

SCS Soil Name	Parameter	Variable	Value	Units	Value Type
Sand	Saturated Hydraulic Conductivity	K_s	26.78	cm/h	Model default
	van Genuchten Soil Water Retention Parameters	α_1	0.03524	$(cm)^{-1}$	Model default
		N	3.177	unitless	Model default
		M	0.6852	unitless	Model default
	Total porosity	n	0.375	cm^3/cm^3	Model default
	Residual Water Content	θ_r	0.053	cm^3/cm^3	Model default
	Mean Grain Diameter		0.044	cm	Model default
	Bulk Density	ρ_b	1.66	g/cm^3	Model default
	Water-filled Porosity	θ_w	0.054	cm^3/cm^3	Model default
	Fraction organic carbon	f_{oc}	0.054	unitless	Model default

Notes:
For conservatism the soil matrix was assumed to be sand for all soil layers at all AOC locations.
Refer to the Johnson & Ettinger Model Users Guide for discussion of individual parameters.

Table A-13a. Summary of Other Inputs Used for the Johnson & Ettinger Vapor Intrusion Modeling - Soil SubModel

Parameter	Variable	Model Defaults	Site AOC or Evaluated Area						Units	Value Type
			Soil Hot Spot 1 (Soil AOC-1)	Soil Hot Spot 2 (Soil AOC-6)	South Side Property (Soil AOC-4)	West Side Property (Soil AOC-5)	Remainder of BROS Property (Excludes Former Lagoon Area)	Former Lagoon Area		
Avg Soil Temp	T_S	10	10	10	10	10	10	NE	°C	Model default
Depth below grade to bottom of enclosed space floor	L_F	200	1	1	1	1	1	NE	cm	Assumed for slab foundation
Depth below grade to top of contamination	L_t	400	60.96	60.96	60.96	60.96	60.96	NE	cm	Site-Specific. Assumes 2-ft cap.
Depth below grade to bottom of contamination	L_b	600	304.8	304.8	304.8	304.8	304.8	NE	cm	Site-Specific;depth to top of water table
Thickness of soil stratum A	h_A	200	30.48	30.48	30.48	30.48	30.48	NE	cm	Assumed 50% of cover above contamination
Thickness of soil stratum B	h_B	100	15.24	15.24	15.24	15.24	15.24	NE	cm	Assumed 25% of cover above contamination
Thickness of soil stratum C	h_C	100	15.24	15.24	15.24	15.24	15.24	NE	cm	Assumed 25% of cover above contamination
Enclosed space floor thickness	L_{crack}	10	10	10	10	10	10	NE	cm	Model default
Soil-bldg pressure differential	ΔP	40	40	40	40	40	40	NE	g/cm-s^2	Model default
Enclosed space floor length	LB	1000	1524	1524	1524	1524	1524	NE	cm	Assumed 50-ft width for small industrial building
Enclosed space floor width	WB	1000	609.6	609.6	609.6	609.6	609.6	NE	cm	Assumed 20-ft width for small industrial building
Enclosed space height	HB	366	366	366	366	366	366	NE	cm	Assumed 12-ft ceilings for industrial building
Floor-wall seam crack width	w	0.1	0.1	0.1	0.1	0.1	0.1	NE	cm	Model default
Indoor air exchange rate	ER	0.25	0.25	0.25	0.25	0.25	0.25	NE	h^{-1}	Model default
Average vapor flow rate into bldg	Q_{soil}	5	(Calculated)	(Calculated)	(Calculated)	(Calculated)	(Calculated)	NE	L/m	No site-specific data were available

Note:
These conditions applied to both the RME and CTE cases.
NE: Not evaluated. The former lagoon area was evaluated for groundwater emissions only.

Table A-13b. Summary of Other Inputs Used for the Johnson & Ettinger Vapor Intrusion Modeling - Groundwater SubModel

Parameter	Variable	Model Defaults	Site AOC or Evaluated Area						Units	Value Type
			Soil Hot Spot 1 (Soil AOC-1)	Soil Hot Spot 2 (Soil AOC-6)	South Side Property (Soil AOC-4)	West Side Property (Soil AOC-5)	Remainder of BROS Property (Excludes Former Lagoon Area)	Former Lagoon Area		
Avg Soil Temp	T_S	10	10	10	10	10	10	10	°C	Model default
Depth below grade to bottom of enclosed space floor	L_F	200	1	1	1	1	1	1	cm	Assumed for slab foundation
Depth below grade to water table	L_{WT}	400	198	198	198	198	198	198	cm	Site-Specific. Average depth to water table across whole site.
Thickness of soil stratum A	h_A	300	100	100	100	100	100	100	cm	Assumed 50% of cover above water table
Thickness of soil stratum B	h_B	50	50	50	50	50	50	50	cm	Assumed 25% of cover above water table
Thickness of soil stratum C	h_C	50	48	48	48	48	48	48	cm	Assumed 25% of cover above water table
Enclosed space floor thickness	L_{crack}	10	15	15	15	15	15	15	cm	Model default
Soil-bldg pressure differential	ΔP	40	40	40	40	40	40	40	g¢m-s ^{2}	Model default
Enclosed space floor length	LB	1000	1524	1524	1524	1524	1524	1524	cm	Assumed 50-ft width for small industrial building
Enclosed space floor width	WB	1000	609.6	609.6	609.6	609.6	609.6	609.6	cm	Assumed 20-ft width for small industrial building
Enclosed space height	HB	366	366	366	366	366	366	366	cm	Assumed 12-ft ceilings for industrial building
Floor-wall seam crack width	w	0.1	0.1	0.1	0.1	0.1	0.1	0.1	cm	Model default
Indoor air exchange rate	ER	0.25	0.25	0.25	0.25	0.25	0.25	0.25	h^{-1}	Model default
Average vapor flow rate into bldg	Q_{soil}	5	(Calculated)	(Calculated)	(Calculated)	(Calculated)	(Calculated)	(Calculated)	L/m	No site-specific data were available

Note:
These conditions applied to both the ME and CTE cases.
NE: Not evaluated. The former lagoon area was evaluated for groundwater emissions only.

Table A-14a. Future Use Scenario - CTE Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils in the Vicinity of Soil Hot Spot 2 (Soil AOC-6)

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1,1-Dichloroethane	NA	2.1E-04	ND	ND		2.1E-04
1,2,4-Trichlorobenzene	NA	6.2E-05	NA	2.4E-02		2.4E-02
1,2-Dichlorobenzene	NA	7.8E-05	NA	9.5E-03		9.6E-03
1,3-Dichlorobenzene	NA	1.2E-04	NA	7.6E-03		7.7E-03
1,4-Dichlorobenzene	NA	2.5E-05	NA	5.1E-03		5.1E-03
2-Methylnapthalene	NA	1.8E-05	NA	7.0E-02		7.0E-02
Acenaphthene	NA	2.0E-06	NA	2.2E-04		2.2E-04
Acetone	NA	2.3E-05	ND	ND		2.3E-05
Anthracene	ND	ND	NA	NA		
Total PCBs	2.0E-07	NA	8.0E-07	NA	1.0E-06	
Benzene	7.7E-07	NA	ND	ND	7.7E-07	
Benzo(a)anthracene	ND	ND	7.6E-10	NA	7.6E-10	
Benzo(a)pyrene	ND	ND	1.2E-09	NA	1.2E-09	
Benzo(b)fluoranthene	ND	ND	2,4e-10	NA		
Benzo(g,h,i)perylene	ND	ND	1.0E-10	NA	1.0E-10	
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA		
Chloroethane	3.1E-08	3.8E-05	ND	ND	3.1E-08	3.8E-05
Chrysene	9.8E-12	NA	7.6E-12	NA	1.7E-11	
cis-1,2-Dichloroethene	NA	7.1E-04	ND	ND		7.1E-04
Ethylbenzene	NA	6.2E-04	NA	7.1E-01		7.1E-01
Fluoranthene	NA	1.4E-06	NA	9.7E-05		9.8E-05
Fluorene	NA	4.3E-06	NA	9.9E-05		1.0E-04
Indeno(1,2,3-cd)pyrene	ND	ND	1.1E-10	NA	1.1E-10	
Naphthalene	NA	1.1E-03	NA	2.9E+00		**2.9E+00**
Phenanthrene	NA	2.8E-03	NA	1.4E+00		**1.4E+00**
PHENOL	NA	1.6E-04	ND	ND		1.6E-04
Pyrene	NA	7.0E-07	NA	2.9E-06		3.6E-06
Tetrachloroethene	2.8E-08	NA	ND	ND	2.8E-08	
Toluene	NA	2.1E-04	NA	1.7E-01		1.7E-01
Vinyl chloride	2.5E-07	2.9E-03	ND	ND	2.5E-07	2.9E-03
Xylenes (Total)	NA	1.2E-02	NA	2.1E+01		**2.1E+01**
Cumulative Risks Across Chemicals	**1.3E-06**	2.1E-02	8.0E-07	**2.6E+01**	**2.1E-06**	**2.6E+01**

Notes:

Calculated using the June 2003 version of the Johnson & Eddinger Vapor Intrusion Model.
Groundwater and soils were from Hot Spot 2, or within 50 to 75-ft of this location. Soils data are from the 0-6 ft interval only.
Only chemicals detected with a frequency greater than 5% were included in this analysis. Exposure Point Concentrations were the 95UCLs.
ND: Not detected or not detected at a frequency greater than or equal to 5%.
NA: Could not quantify due to lack of relevant physico-chemical or toxicity data.

Table A-14b. Future Use Scenario - RME Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils in the Vicinity of Soil Hot Spot 2 (Soil AOC-6)

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1,1-Dichloroethane	NA	3.51E-04	ND	ND		3.51E-04
1,2,4-Trichlorobenzene	NA	1.03E-04	NA	3.05E-02		3.06E-02
1,2-Dichlorobenzene	NA	1.29E-04	NA	6.38E-03		6.50E-03
1,3-Dichlorobenzene	NA	2.08E-04	NA	7.84E-03		8.05E-03
1,4-Dichlorobenzene	NA	4.22E-05	NA	2.82E-03		2.86E-03
2-Methylnapthalene	NA	3.00E-05	NA	1.05E-01		1.05E-01
Acenaphthene	NA	3.35E-06	NA	3.59E-04		3.63E-04
Acetone	NA	3.81E-05	ND	ND		3.81E-05
Anthracene	ND	ND	NA	NA		
Total PCBs	1.17E-06	NA	4.75E-06	NA	**5.92E-06**	
Benzene	4.59E-06	NA	ND	ND	**4.59E-06**	
Benzo(a)anthracene	ND	ND	4.53E-09	NA	4.53E-09	
Benzo(a)pyrene	ND	ND	7.40E-09	NA	7.40E-09	
Benzo(b)fluoranthene	ND	ND	1.40E-09	NA	1.40E-09	
Benzo(g,h,i)perylene	ND	ND	6.30E-10	NA	6.30E-10	
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA		
Chloroethane	1.85E-07	6.26E-05	ND	ND	1.85E-07	6.26E-05
Chrysene	5.83E-11	NA	4.53E-11	NA	1.04E-10	
cis-1,2-Dichloroethene	NA	1.18E-03	ND	ND		1.18E-03
Ethylbenzene	NA	1.04E-03	NA	3.32E-01		3.33E-01
Fluoranthene	NA	2.37E-06	NA	1.61E-04		1.63E-04
Fluorene	NA	7.10E-06	NA	1.64E-04		1.71E-04
Indeno(1,2,3-cd)pyrene	ND	ND	6.56E-10	NA	6.56E-10	
Naphthalene	NA	1.87E-03	NA	4.15E00		**4.15E+00**
Phenanthrene	NA	4.69E-03	NA	2.02E00		**2.03E+00**
PHENOL	NA	2.66E-04	ND	ND		2.66E-04
Pyrene	NA	1.17E-06	NA	4.76E-06		5.92E-06
Tetrachloroethene	1.64E-07	NA	ND	ND	1.64E-07	
Toluene	NA	3.42E-04	NA	7.97E-02		8.00E-02
Vinyl chloride	1.51E-06	4.79E-03	ND	ND	**1.51E-06**	4.79E-03
Xylenes (Total)	NA	2.00E-02	NA	9.70E00		**9.72E+00**
Cumulative Risks Across Chemicals	**7.6E-06**	3.5E-02	4.8E-06	**1.6E+01**	**1.2E-05**	**1.6E+01**

Notes:

Calculated using the June 2003 version of the Johnson & Eddinger Vapor Intrusion Model.
Groundwater and soils were from Hot Spot 2, or within 50 to 75-ft of this location. Soils data are from the 0-6 ft interval only.
Only chemicals detected with a frequency greater than 5% were included in this analysis. Exposure Point Concentrations were the 95UCLs.
ND: Not detected or not detected at a frequency greater than or equal to 5%.
NA: Could not quantify due to lack of relevant physico-chemical or toxicity data.

Table A-15a. Future Use Scenario - CTE Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils in the Vicinity of Soil Hot Spot 1 (Soil AOC-1)

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1,1,1-Trichloroethane	NA	8.3E-03	ND	ND		8.3E-03
1,1-Dichloroethane	NA	2.2E-02	ND	ND		2.2E-02
1,2,4-Trichlorobenzene	NA	1.9E-05	NA	3.8E-02		3.8E-02
1,2-Dichlorobenzene	NA	7.0E-04	NA	7.3E-01		7.3E-01
1,2-Dichloroethane	1.9E-06	NA	ND	ND	**1.9E-06**	
1,4-Dichlorobenzene	NA	1.9E-05	NA	1.3E-02		1.3E-02
2-Methylnapthalene	NA	3.2E-04	NA	4.5E-01		4.5E-01
4-Methyl-2-pentanone	NA	3.0E-03	ND	ND		3.0E-03
Acenaphthene	NA	2.0E-06	NA	7.3E-04		7.3E-04
Acetone	NA	2.9E-04	ND	ND		2.9E-04
Anthracene	ND	ND	NA	NA		
Total PCBs	ND	ND	8.0E-07	NA	8.0E-07	
Benzene	2.7E-05	NA	ND	ND	**2.7E-05**	
Benzo(a)anthracene	ND	ND	1.4E-09	NA	1.4E-09	
Benzo(a)pyrene	ND	ND	9.9E-10	NA	9.9E-10	
Benzo(b)fluoranthene	ND	ND	1.4E-10	NA	1.4E-10	
Benzo(g,h,i)perylene	ND	ND	5.9E-11	NA	5.9E-11	
Benzo(k)fluoranthene	ND	ND	6.3E-11	NA	6.3E-11	
bis(2-Chloroethyl)ether	1.2E-07	NA	ND	ND	1.2E-07	
bis(2-Ethylhexyl)phthalate	ND	ND	NA	NA		
Chlorobenzene	NA	1.3E-02	ND	ND		1.3E-02
Chloroform	7.0E-06	NA	ND	ND	**7.0E-06**	
Chrysene	ND	ND	2.5E-11	NA	2.5E-11	
cis-1,2-Dichloroethene	NA	1.2E+01	ND	ND		**1.2E+01**
Dibenzofuran	ND	ND	NA	2.4E-06		2.4E-06
Ethylbenzene	NA	2.5E-02	ND	ND		2.5E-02
Fluoranthene	ND	ND	NA	1.6E-04		1.6E-04
Fluorene	ND	ND	NA	3.6E-04		3.6E-04
Indeno(1,2,3-cd)pyrene	ND	ND	6.4E-11	NA	6.4E-11	
Naphthalene	NA	4.6E-02	NA	1.3E+01		**1.4E+01**
Phenanthrene	NA	8.4E-04	NA	5.1E+00		**5.1E+00**
PHENOL	ND	ND	NA	9.0E-01		9.0E-01

Table A-15a. Future Use Scenario - CTE Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils in the Vicinity of Soil Hot Spot 1 (Soil AOC-1)

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
Pyrene	ND	ND	NA	8.9E-06		8.9E-06
Toluene	NA	2.6E-01	ND	ND		2.6E-01
trans-1,2-Dichloroethene	NA	6.4E-02	ND	ND		6.4E-02
Trichloroethene	4.0E-04	9.1E-01	ND	ND	**4.0E-04**	9.1E-01
Vinyl chloride	6.1E-05	6.9E-01	ND	ND	**6.1E-05**	6.9E-01
Xylenes (Total)	NA	1.1E00	ND	ND		**1.1E+00**
Cumulative Risks Across Chemicals	**5.0E-04**	**1.5E+01**	8.0E-07	**2.1E+01**	**5.0E-04**	**3.5E+01**

Notes:

Calculated using the June 2003 version of the Johnson & Eddinger Vapor Intrusion Model.
Groundwater and soils were from Hot Spot 1, or within 50 to 75-ft of this location. Soils data are from the 0-6 ft interval only.
Only chemicals detected with a frequency greater than 5% were included in this analysis. Exposure Point Concentrations were the 95UCLs.
ND: Not detected or not detected at a frequency greater than or equal to 5%.
NA: Could not quantify due to lack of relevant physico-chemical or toxicity data.

Table A-15b. Future Use Scenario - RME Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils in the Vicinity of Soil Hot Spot 1 (Soil AOC-1)

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1,1,1-Trichloroethane	NA	1.4E-02	ND	ND		1.4E-02
1,1-Dichloroethane	NA	3.6E-02	ND	ND		3.6E-02
1,2,4-Trichlorobenzene	NA	3.1E-05	NA	4.8E-02		4.8E-02
1,2-Dichlorobenzene	NA	1.2E-03	NA	4.8E-01		4.9E-01
1,2-Dichloroethane	1.1E-05	NA	ND	ND	**1.1E-05**	
1,4-Dichlorobenzene	NA	3.2E-05	NA	7.0E-03		7.0E-03
2-Methylnapthalene	NA	5.4E-04	NA	6.7E-01		6.8E-01
4-Methyl-2-pentanone	NA	5.0E-03	ND	ND		5.0E-03
Acenaphthene	NA	3.4E-06	NA	1.2E-03		1.2E-03
Acetone	NA	4.8E-04	ND	ND		4.8E-04
Anthracene	ND	ND	NA	NA		
Total PCBs	ND	ND	4.8E-06	NA	**4.8E-06**	
Benzene	1.6E-04	NA	ND	ND	**1.6E-04**	
Benzo(a)anthracene	ND	ND	8.5E-09	NA	8.5E-09	
Benzo(a)pyrene	ND	ND	5.9E-09	NA	5.9E-09	
Benzo(b)fluoranthene	ND	ND	8.4E-10	NA	8.4E-10	
Benzo(g,h,i)perylene	ND	ND	3.5E-10	NA	3.5E-10	
Benzo(k)fluoranthene	ND	ND	3.7E-10	NA	3.7E-10	
bis(2-Chloroethyl)ether	6.9E-07	NA	ND	ND	6.9E-07	
bis(2-Ethylhexyl)phthalate	ND	ND	NA	NA		
Chlorobenzene	NA	2.1E-02	ND	ND		2.1E-02
Chloroform	4.2E-05	NA	ND	ND	**4.2E-05**	
Chrysene	ND	ND	1.5E-10	NA	1.5E-10	
cis-1,2-Dichloroethene	NA	1.9E⊕1	ND	ND		**1.9E+01**
Dibenzofuran	ND	ND	NA	4.0E-06		4.0E-06
Ethylbenzene	NA	4.2E-02	ND	ND		4.2E-02
Fluoranthene	ND	ND	NA	2.7E-04		2.7E-04
Fluorene	ND	ND	NA	6.0E-04		6.0E-04
Indeno(1,2,3-cd)pyrene	ND	ND	3.8E-10	NA	3.8E-10	
Naphthalene	NA	7.7E-02	NA	1.9E⊕1		**1.9E+01**
Phenanthrene	NA	1.4E-03	NA	7.3E⊕0		**7.3E+00**
PHENOL	ND	ND	NA	1.1E⊕0		**1.1E+00**

Table A-15b. Future Use Scenario - RME Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils in the Vicinity of Soil Hot Spot 1 (Soil AOC-1)

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
Pyrene	ND	ND	NA	1.5E-05		1.5E-05
Toluene	NA	4.3E-01	ND	ND		4.3E-01
trans-1,2-Dichloroethene	NA	1.1E-01	ND	ND		1.1E-01
Trichloroethene	2.4E-03	1.5E00	ND	ND	**2.4E-03**	**1.5E+00**
Vinyl chloride	3.6E-04	1.1E00	ND	ND	**3.6E-04**	**1.1E+00**
Xylenes (Total)	NA	1.8E00	ND	ND		**1.8E+00**
Cumulative Risks Across Chemicals	**2.9E-03**	**2.5E+01**	**4.8E-06**	**2.9E+01**	**3.0E-03**	**5.3E+01**

Notes:

Calculated using the June 2003 version of the Johnson & Eddinger Vapor Intrusion Model.
Groundwater and soils were from Hot Spot 1, or within 50 to 75-ft of this location. Soils data are from the 0-6 ft interval only.
Only chemicals detected with a frequency greater than 5% were included in this analysis. Exposure Point Concentrations were the 95UCLs.
ND: Not detected or not detected at a frequency greater than or equal to 5%.
NA: Could not quantify due to lack of relevant physico-chemical or toxicity data.

Table A-16a. Future Use Scenario - CTE Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils on the West Side of the BOS Property (Soil AOC-5)

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1,1-Dichloroethane	NA	2.1E-04	ND	ND		2.1E-04
1,2,4-Trichlorobenzene	NA	6.2E-05	ND	ND		6.2E-05
1,2-Dichlorobenzene	NA	7.8E-05	ND	ND		7.8E-05
1,3-Dichlorobenzene	NA	1.2E-04	ND	ND		1.2E-04
1,4-Dichlorobenzene	NA	2.5E-05	ND	ND		2.5E-05
2-Methylnapthalene	NA	1.8E-05	ND	ND		1.8E-05
Acenaphthene	NA	2.0E-06	ND	ND		2.0E-06
Acetone	NA	2.3E-05	ND	ND		2.3E-05
Total PCBs	2.0E-07	NA	8.4E-09	NA	2.0E-07	
Benzene	7.7E-07	NA	ND	ND	7.7E-07	
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA		
Chloroethane	3.1E-08	3.8E-05	ND	ND	3.1E-08	3.8E-05
Chrysene	9.8E-12	NA	ND	ND	9.8E-12	
cis-1,2-Dichloroethene	NA	2.8E-03	ND	ND		2.8E-03
Ethylbenzene	NA	6.2E-04	ND	ND		6.2E-04
Fluoranthene	NA	1.4E-06	ND	ND		1.4E-06
Fluorene	NA	4.3E-06	ND	ND		4.3E-06
Naphthalene	NA	1.1E-03	ND	ND		1.1E-03
Phenanthrene	NA	2.8E-03	ND	ND		2.8E-03
PHENOL	NA	1.6E-04	ND	ND		1.6E-04
Pyrene	NA	7.0E-07	ND	ND		7.0E-07
Tetrachloroethene	8.3E-08	NA	ND	ND	8.3E-08	
Toluene	NA	2.1E-04	ND	ND		2.1E-04

Table A-16a. Future Use Scenario - CTE Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils on the West Side of the BOS Property (Soil AOC-5)

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
Trichloroethene	2.0E-06	4.6E-03	ND	ND	**2.0E-06**	4.6E-03
Vinyl chloride	2.5E-07	2.9E-03	ND	ND	2.5E-07	2.9E-03
Xylenes (Total)	NA	1.2E-02	NA	5.7E-04		1.3E-02
Cumulative Risks Across Chemicals	**3.4E-06**	2.8E-02	8.4E-09	5.7E-04	**3.4E-06**	2.8E-02

Notes:

Calculated using the June 2003 version of the Johnson & Eddinger Vapor Intrusion Model.
Groundwater and soils were from the West Side Property (Soil AOC-5) or within 50 to 75-ft of this location. Soils data are from the 0-6 ft interval only.
Only chemicals detected with a frequency greater than 5% were included in this analysis. Exposure Point Concentrations were the 95UCLs.
ND: Not detected or not detected at a frequency greater than or equal to 5%.
NA: Could not quantify due to lack of relevant physico-chemical or toxicity data.

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Table A-16b. Future Use Scenario - RME Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils on the West Side of the BROS Property (Soil AOC-5)

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1,1-Dichloroethane	NA	3.5E-04	ND	ND		3.5E-04
1,2,4-Trichlorobenzene	NA	1.0E-04	ND	ND		1.0E-04
1,2-Dichlorobenzene	NA	1.3E-04	ND	ND		1.3E-04
1,3-Dichlorobenzene	NA	2.1E-04	ND	ND		2.1E-04
1,4-Dichlorobenzene	NA	4.2E-05	ND	ND		4.2E-05
2-Methylnapthalene	NA	3.0E-05	ND	ND		3.0E-05
Acenaphthene	NA	3.4E-06	ND	ND		3.4E-06
Acetone	NA	3.8E-05	ND	ND		3.8E-05
Total PCBs	1.2E-06	NA	5.0E-08	NA	**1.2E-06**	
Benzene	4.6E-06	NA	ND	ND	**4.6E-06**	
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA		
Chloroethane	1.9E-07	6.3E-05	ND	ND	1.9E-07	6.3E-05
Chrysene	5.8E-11	NA	ND	ND	5.8E-11	
cis-1,2-Dichloroethene	NA	4.7E-03	ND	ND		4.7E-03
Ethylbenzene	NA	1.0E-03	ND	ND		1.0E-03
Fluoranthene	NA	2.4E-06	ND	ND		2.4E-06
Fluorene	NA	7.1E-06	ND	ND		7.1E-06
Naphthalene	NA	1.9E-03	ND	ND		1.9E-03
Phenanthrene	NA	4.7E-03	ND	ND		4.7E-03
PHENOL	NA	2.7E-04	ND	ND		2.7E-04
Pyrene	NA	1.2E-06	ND	ND		1.2E-06
Tetrachloroethene	4.9E-07	NA	ND	ND	4.9E-07	
Toluene	NA	3.4E-04	ND	ND		3.4E-04

Table A-16b. **Future Use Scenario - RME Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils on the West Side of the BROS Property (Soil AOC-5)**

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
Trichloroethene	1.2E-05	7.7E-03	ND	ND	**1.2E-05**	7.7E-03
Vinyl chloride	1.5E-06	4.8E-03	ND	ND	**1.5E-06**	4.8E-03
Xylenes (Total)	NA	2.0E-02	NA	2.7E-04		2.0E-02
Cumulative Risks Across Chemicals	**2.0E-05**	4.6E-02	5.0E-08	2.7E-04	**2.0E-05**	4.7E-02

Notes:

Calculated using the June 2003 version of the Johnson & Eddinger Vapor Intrusion Model.
Groundwater and soils were from the West Side Property (Soil AOC-5) or within 50 to 75-ft of this location. Soils data are from the 0-6 ft interval only.
Only chemicals detected with a frequency greater than 5% were included in this analysis. Exposure Point Concentrations were the 95UCLs.
ND: Not detected or not detected at a frequency greater than or equal to 5%.
NA: Could not quantify due to lack of relevant physico-chemical or toxicity data.

Table A-17a. Future Use Scenario - CTE Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils on the South Side of the BROS Property (Soil AOC-4)

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1,2-Dichloroethane	1.2E-07	NA	ND	ND	1.2E-07	
Acenaphthene	NA	4.0E-06	ND	ND		4.0E-06
Aroclor-1260	ND	ND	3.3E-09	NA	3.3E-09	
Total PCBs	ND	ND	3.3E-09	NA	3.3E-09	
Benzene	1.1E-07	NA	ND	ND	1.1E-07	
bis(2-Chloroethyl)ether	1.6E-06	NA	ND	ND	**1.6E-06**	
Dibenzofuran	NA	1.3E-08	ND	ND		1.3E-08
Fluoranthene	NA	5.7E-06	ND	ND		5.7E-06
Fluorene	NA	2.8E-06	ND	ND		2.8E-06
Phenanthrene	NA	5.1E-03	ND	ND		5.1E-03
Pyrene	NA	7.0E-07	NA	1.1E-07		8.1E-07
Cumulative Risks Across Chemicals	**1.8E-06**	5.1E-03	6.6E-09	1.1E-07	**1.8E-06**	5.1E-03

Notes:

Calculated using the June 2003 version of the Johnson & Eddinger Vapor Intrusion Model.

Groundwater and soils were from the South Side Property (Soil AOC-4) or within 50 to 75-ft of this location. Soils data are from the 0-6 ft interval only.

Only chemicals detected with a frequency greater than 5% were included in this analysis. Exposure Point Concentrations were the 95UCLs.

ND: Not detected or not detected at a frequency greater than or equal to 5%.

NA: Could not quantify due to lack of relevant physico-chemical or toxicity data.

Table A-17b. Future **Use Scenario - RME Exposure** for Commercial Worker - **Summary of Potential Incremental Carcinogenic Risk** and Hazard Quotients **from Vapors** Released from Ground Water or **Soils on the South Side of the BROS Property (Soil AOC-4)**

Compound	Ground Water-Based		Soil-Based		Combined	
	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1,2-Dichloroethane	7.2E-07	NA	ND	ND	7.2E-07	
Acenaphthene	NA	6.7E-06	ND	ND		6.7E-06
Total PCBs	ND	ND	2.0E-08	NA	2.0E-08	
Benzene	6.3E-07	NA	ND	ND	6.3E-07	
bis(2-Chloroethyl)ether	9.2E-06	NA	ND	ND	**9.2E-06**	
Dibenzofuran	NA	2.1E-08	ND	ND		2.1E-08
Fluoranthene	NA	9.5E-06	ND	ND		9.5E-06
Fluorene	NA	4.7E-06	ND	ND		4.7E-06
Phenanthrene	NA	8.4E-03	ND	ND		8.4E-03
Pyrene	NA	1.2E-06	NA	1.8E-07		1.3E-06
Cumulative Risks Across Chemicals	**1.1E-05**	8.5E-03	2.0E-08	1.8E-07	**1.1E-05**	8.5E-03

Notes:

Calculated using the June 2003 version of the Johnson & Eddinger Vapor Intrusion Model.

Groundwater and soils were from the South Side Property (Soil AOC-4) or within 50 to 75-ft of this location. Soils data are from the 0-6 ft interval only.

Only chemicals detected with a frequency greater than 5% were included in this analysis. Exposure Point Concentrations were the 95UCLs.

ND: Not detected or not detected at a frequency greater than or equal to 5%.

NA: Could not quantify due to lack of relevant physico-chemical or toxicity data.

Table A-18a. Future Use Scenario - CTE Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils from the Remainder of the BROS Property (Excluding Former Lagoon Area)

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1,1,1-Trichloroethane	ND	ND	ND	ND		
1,1-Dichloroethane	NA	3.3E-04	ND	ND		3.3E-04
1,1-Dichloroethene	ND	ND	ND	ND		
1,2,4-Trichlorobenzene	ND	ND	NA	1.8E-03		1.8E-03
1,2-Dichlorobenzene	NA	5.4E-04	NA	2.2E-02		2.2E-02
1,2-Dichloroethane	ND	ND	ND	ND		
1,2-Dichloropropane	ND	ND	ND	ND		
1,4-Dichlorobenzene	NA	1.9E-05	NA	1.5E-03		1.5E-03
2-Butanone	NA	1.2E-06	NA	1.0E-03		1.0E-03
2-Methylnapthalene	NA	1.8E-05	NA	5.2E-02		5.2E-02
4-Methyl-2-pentanone	ND	ND	ND	ND		
Acenaphthene	NA	1.2E-05	NA	1.1E-04		1.3E-04
Acetone	NA	3.1E-05	NA	6.5E-04		6.8E-04
Anthracene	ND	ND	NA	NA		
Total PCBs	7.1E-09	NA	8.0E-07	NA	8.1E-07	
Benzene	1.1E-06	NA	2.9E-07	NA	**1.4E-06**	
Benzo(a)anthracene	ND	ND	5.9E-10	NA	5.9E-10	
Benzo(a)pyrene	ND	ND	1.8E-09	NA	1.8E-09	
Benzo(b)fluoranthene	ND	ND	2.4E-10	NA	2.4E-10	
Benzo(g,h,i)perylene	ND	ND	1.2E-10	NA	1.2E-10	
Benzo(k)fluoranthene	ND	ND	7.6E-11	NA	7.6E-11	
bis(2-Chloroethyl)ether	1.7E-07	NA	ND	ND	1.7E-07	
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA		
Carbon disulfide	ND	ND	NA	8.1E-05		8.1E-05
Chlorobenzene	NA	2.0E-02	NA	1.2E-02		3.3E-02
Chloroethane	2.7E-08	3.3E-05	ND	ND	2.7E-08	3.3E-05
Chloroform	ND	ND	ND	ND		
Chrysene	ND	ND	1.3E-11	NA	1.3E-11	
cis-1,2-Dichloroethene	NA	7.7E-04	NA	6.5E-03		7.3E-03
Dibenzofuran	ND	ND	NA	2.4E-07		2.4E-07
Ethylbenzene	NA	2.0E-03	NA	2.6E-03		4.6E-03
Fluoranthene	ND	ND	NA	1.1E-04		1.1E-04

Table A-18a. Future Use Scenario - CTE Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils from the Remainder of the BROS Property (Excluding Former Lagoon Area)

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
Fluorene	NA	1.4E-06	NA	7.9E-05		8.1E-05
Indeno(1,2,3-cd)pyrene	ND	ND	9.6E-11	NA	9.6E-11	
Methylene chloride	ND	ND	1.2E-08	8.5E-05	1.2E-08	8.5E-05
Naphthalene	NA	1.2E-02	NA	3.7E-01		3.8E-01
Phenanthrene	ND	ND	NA	1.8E+00		**1.8E+00**
Phenol	ND	ND	NA	2.8E-02		2.8E-02
Pyrene	ND	ND	NA	4.2E-06		4.2E-06
Tetrachloroethene	ND	ND	1.0E-07	NA	1.0E-07	
Toluene	NA	6.8E-03	NA	2.7E-02		3.4E-02
Trichloroethene	ND	ND	4.1E-06	9.3E-03	**4.1E-06**	9.3E-03
Xylenes (Total)	NA	7.6E-02	NA	1.3E-01		2.0E-01
Cumulative Risks Across Chemicals	**1.3E-06**	1.2E-01	**5.3E-06**	**2.5E+00**	**6.6E-06**	**2.6E+00**

Notes:

Calculated using the June 2003 version of the Johnson & Eddinger Vapor Intrusion Model.
Groundwater and soils were from the remaining areas of the BROS Property not included in other evaluated areas or AOC and also excluding MW-26S (representing the former Lagoon area). Soils data are from the 0-6 ft interval only.
Only chemicals detected with a frequency greater than 5% were included in this analysis. Exposure Point Concentrations were the 95UCLs.
ND: Not detected or not detected at a frequency greater than or equal to 5%.
NA: Could not quantify due to lack of relevant physico-chemical or toxicity data.

Table A-18b. Future Use Scenario - RME Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils from the Remainder of the BROS Property (Excluding Former Lagoon Area)

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1,1,1-Trichloroethane	ND	ND	ND	ND		
1,1-Dichloroethane	NA	5.5E-04	ND	ND		5.5E-04
1,1-Dichloroethene	ND	ND	ND	ND		
1,2,4-Trichlorobenzene	ND	ND	NA	2.4E-03		2.4E-03
1,2-Dichlorobenzene	NA	9.0E-04	NA	1.5E-02		1.6E-02
1,2-Dichloroethane	ND	ND	ND	ND		
1,2-Dichloropropane	ND	ND	ND	ND		
1,4-Dichlorobenzene	NA	3.2E-05	NA	8.3E-04		8.6E-04
2-Butanone	NA	2.1E-06	NA	5.2E-04		5.2E-04
2-Methylnapthalene	NA	3.0E-05	NA	7.8E-02		7.8E-02
4-Methyl-2-pentanone	ND	ND	ND	ND		
Acenaphthene	NA	2.0E-05	NA	1.9E-04		2.1E-04
Acetone	NA	5.2E-05	NA	3.0E-04		3.6E-04
Anthracene	ND	ND	NA	NA		
Total PCBs	4.2E-08	NA	4.8E-06	NA	**4.8E-06**	
Benzene	6.5E-06	NA	4.8E-07	NA	**7.0E-06**	
Benzo(a)anthracene	ND	ND	3.5E-09	NA	3.5E-09	
Benzo(a)pyrene	ND	ND	1.1E-08	NA	1.1E-08	
Benzo(b)fluoranthene	ND	ND	1.4E-09	NA	1.4E-09	
Benzo(g,h,i)perylene	ND	ND	7.2E-10	NA	7.2E-10	
Benzo(k)fluoranthene	ND	ND	9.5E-10	NA	9.5E-10	
bis(2-Chloroethyl)ether	1.0E-06	NA	ND	ND	**1.00E-06**	
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA		
Carbon disulfide	ND	ND	NA	3.8E-05		3.8E-05
Chlorobenzene	NA	3.4E-02	NA	5.8E-03		4.0E-02
Chloroethane	1.6E-07	5.4E-05	ND	ND	1.6E-07	5.4E-05
Chloroform	ND	ND	ND	ND		
Chrysene	ND	ND	7.8E-11	NA	7.8E-11	
cis-1,2-Dichloroethene	NA	1.3E-03	NA	3.0E-03		4.3E-03
Dibenzofuran	ND	ND	NA	4.0E-07		4.0E-07
Ethylbenzene	NA	3.4E-03	NA	1.2E-03		4.6E-03
Fluoranthene	ND	ND	NA	1.9E-04		1.9E-04

Table A-18b. Future **Use Scenario - RME Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water or Soils from the Remainder of the BROS Property (Excluding Former Lagoon Area)**

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
Fluorene	NA	2.3E-06	NA	1.3E-04		1.3E-04
Indeno(1,2,3-cd)pyrene	ND	ND	5.7E-10	NA	5.7E-10	
Methylene chloride	ND	ND	2.0E-08	4.0E-05	2.0E-08	4.0E-05
Naphthalene	NA	2.0E-02	NA	5.3E-01		5.5E-01
Phenanthrene	ND	ND	NA	2.6E+00		**2.6E+00**
Phenol	ND	ND	NA	3.4E-02		3.4E-02
Pyrene	ND	ND	NA	7.0E-06		7.0E-06
Tetrachloroethene	ND	ND	1.7E-07	NA	1.7E-07	
Toluene	NA	1.1E-02	NA	1.3E-02		2.4E-02
Trichloroethene	ND	ND	6.8E-06	4.3E-03	**6.8E-06**	4.3E-03
Xylenes (Total)	NA	1.3E-01	NA	5.8E-02		1.9E-01
Cumulative Risks Across Chemicals	**7.7E-06**	2.0E-01	**1.2E-05**	**3.3E+00**	**2.0E-05**	**3.5E+00**

Notes:

Calculated using the June 2003 version of the Johnson & Eddinger Vapor Intrusion Model.
Groundwater and soils were from the remaining areas of the BROS Property not included in other evaluated areas or AOC and also excluding MW-26S (representing the former Lagoon area). Soils data are from the 0-6 ft interval only.
Only chemicals detected with a frequency greater than 5% were included in this analysis. Exposure Point Concentrations were the 95UCLs.
ND: Not detected or not detected at a frequency greater than or equal to 5%.
NA: Could not quantify due to lack of relevant physico-chemical or toxicity data.

Table A-19a. Future Use Scenario - CTE Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water from the Former Lagoon Area of the BROS Property

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1,1,1-Trichloroethane	NA	3.6E-03	---	---		3.6E-03
1,1-Dichloroethane	NA	6.5E-03	---	---		6.5E-03
1,1-Dichloroethene	NA	5.3E-03	---	---		5.3E-03
1,2,4-Trichlorobenzene	NA	7.4E-05	---	---		7.4E-05
1,2-Dichlorobenzene	NA	3.1E-04	---	---		3.1E-04
1,2-Dichloroethane	3.0E-06	NA	---	---	**3.0E-06**	
1,2-Dichloropropane	3.2E-07	4.2E-02	---	---	3.2E-07	4.2E-02
1,4-Dichlorobenzene	NA	1.3E-05	---	---		1.3E-05
2-Butanone	NA	6.9E-04	---	---		6.9E-04
2-Methylnapthalene	NA	2.2E-03	---	---		2.2E-03
4-Methyl-2-pentanone	NA	9.0E-03	---	---		9.0E-03
Acenaphthene	NA	6.0E-06	---	---		6.0E-06
Acetone	NA	1.1E-02	---	---		1.1E-02
Benzene	1.2E-05	NA	---	---	**1.2E-05**	
Benzo(a)anthracene	3.3E-09	NA	---	---	3.3E-09	
Benzo(a)pyrene	1.4E-08	NA	---	---	1.4E-08	
Benzo(b)fluoranthene	1.4E-09	NA	---	---	1.4E-09	
Benzo(g,h,i)perylene	1.4E-09	NA	---	---	1.4E-09	
bis(2-Chloroethyl)ether	8.0E-06	NA	---	---	**8.0E-06**	
Carbon disulfide	NA	5.1E-02	---	---		5.1E-02
Chlorobenzene	NA	1.2E-03	---	---		1.2E-03
Chloroethane	1.5E-06	1.8E-03	---	---	**1.5E-06**	1.8E-03
Chloroform	1.4E-06	NA	---	---	**1.4E-06**	
Chrysene	3.9E-11	NA	---	---	3.9E-11	
cis-1,2-Dichloroethene	NA	3.0E-01	---	---		3.0E-01
Dibenzofuran	NA	4.3E-08	---	---		4.3E-08
Ethylbenzene	NA	2.5E-03	---	---		2.5E-03
Fluoranthene	NA	1.1E-05	---	---		1.1E-05
Fluorene	NA	1.7E-05	---	---		1.7E-05
Indeno(1,2,3-cd)pyrene	9.4E-10	NA	---	---	9.4E-10	
Methylene chloride	2.8E-07	1.9E-03	---	---	2.8E-07	1.9E-03
Naphthalene	NA	1.6E-01	---	---		1.6E-01

Table A-19a. Future Use Scenario - CTE Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water from the Former Lagoon Area of the BROS Property

	Ground Water-Based		Soil-Based		Combined	
Compound	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
Phenanthrene	NA	2.0E-02	---	---		2.0E-02
PHENOL	NA	4.5E-02	---	---		4.5E-02
Pyrene	NA	2.6E-06	---	---		2.6E-06
Tetrachloroethene	9.7E-07	NA	---	---	9.7E-07	
Toluene	NA	7.6E-02	---	---		7.6E-02
trans-1,2-Dichloroethene	NA	2.5E-03	---	---		2.5E-03
Trichloroethene	3.7E-04	8.4E-01	---	---	**3.7E-04**	8.4E-01
Vinyl chloride	6.6E-06	7.5E-02	---	---	**6.6E-06**	7.5E-02
Xylenes (Total)	NA	1.1E-01	---	---		1.1E-01
Cumulative Risks Across Chemicals	**4.1E-04**	**1.8E+00**	**---**	**---**	**4.1E-04**	**1.8E+00**

Notes:

Calculated using the June 2003 version of the Johnson & Eddinger Vapor Intrusion Model.

Groundwater in the vicintiy of MW-26S was evaluated for this subarea of the Rest of BROS property. There were no soils data that fell within the 0-6 ft depth interval that corresponded to this area.

Only chemicals detected with a frequency greater than 5% were included in this analysis. Exposure Point Concentrations were the 95UCLs.

ND: Not detected or not detected at a frequency greater than or equal to 5%.

NA: Could not quantify due to lack of relevant physico-chemical or toxicity data.

Table A-19b. Future Use Scenario - RME Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water from the Former Lagoon Area of the BROS Property

Compound	Ground Water-Based		Soil-Based		Combined	
	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1,1,1-Trichloroethane	NA	6.0E-03	---	---		6.0E-03
1,1-Dichloroethane	NA	1.1E-02	---	---		1.1E-02
1,1-Dichloroethene	NA	8.8E-03	---	---		8.8E-03
1,2,4-Trichlorobenzene	NA	1.2E-04	---	---		1.2E-04
1,2-Dichlorobenzene	NA	5.2E-04	---	---		5.2E-04
1,2-Dichloroethane	1.8E-05	NA	---	---	**1.8E-05**	
1,2-Dichloropropane	1.9E-06	6.9E-02	---	---	**1.9E-06**	6.9E-02
1,4-Dichlorobenzene	NA	2.1E-05	---	---		2.1E-05
2-Butanone	NA	1.2E-03	---	---		1.2E-03
2-Methylnapthalene	NA	3.6E-03	---	---		3.6E-03
4-Methyl-2-pentanone	NA	1.5E-02	---	---		1.5E-02
Acenaphthene	NA	1.0E-05	---	---		1.0E-05
Acetone	NA	1.8E-02	---	---		1.8E-02
Benzene	7.1E-05	NA	---	---	**7.1E-05**	
Benzo(a)anthracene	2.0E-08	NA	---	---	2.0E-08	
Benzo(a)pyrene	8.4E-08	NA	---	---	8.4E-08	
Benzo(b)fluoranthene	8.4E-09	NA	---	---	8.4E-09	
Benzo(g,h,i)perylene	8.4E-09	NA	---	---	8.4E-09	
bis(2-Chloroethyl)ether	4.8E-05	NA	---	---	**4.8E-05**	
Carbon disulfide	NA	8.4E-02	---	---		8.4E-02
Chlorobenzene	NA	2.1E-03	---	---		2.1E-03
Chloroethane	8.7E-06	2.9E-03	---	---	**8.7E-06**	2.9E-03
Chloroform	8.4E-06	NA	---	---	**8.4E-06**	
Chrysene	2.3E-10	NA	---	---	2.3E-10	
cis-1,2-Dichloroethene	NA	5.0E-01	---	---		5.0E-01
Dibenzofuran	NA	7.2E-08	---	---		7.2E-08
Ethylbenzene	NA	4.1E-03	---	---		4.1E-03
Fluoranthene	NA	1.9E-05	---	---		1.9E-05
Fluorene	NA	2.8E-05	---	---		2.8E-05
Indeno(1,2,3-cd)pyrene	5.6E-09	NA	---	---	5.6E-09	
Methylene chloride	1.6E-06	3.2E-03	---	---	**1.6E-06**	3.2E-03
Naphthalene	NA	2.7E-01	---	---		2.7E-01

Table A-19b. Future **Use Scenario - RME Exposure for Commercial Worker - Summary of Potential Incremental Carcinogenic Risk and Hazard Quotients from Vapors Released from Ground Water from the Former Lagoon Area of the BROS Property**

Compound	Ground Water-Based		Soil-Based		Combined	
	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
Phenanthrene	NA	3.4E-02	---	---		3.4E-02
PHENOL	NA	7.6E-02	---	---		7.6E-02
Pyrene	NA	4.3E-06	---	---		4.3E-06
Tetrachloroethene	5.8E-06	NA	---	---	**5.8E-06**	
Toluene	NA	1.3E-01	---	---		1.3E-01
trans-1,2-Dichloroethene	NA	4.1E-03	---	---		4.1E-03
Trichloroethene	2.2E-03	1.4E+00	---	---	**2.2E-03**	**1.4E+00**
Vinyl chloride	3.9E-05	1.2E-01	---	---	**3.9E-05**	1.2E-01
Xylenes (Total)	NA	1.9E-01	---	---		1.9E-01
Cumulative Risks Across Chemicals	**2.4E-03**	**3.0E+00**	---	---	**2.4E-03**	**3.0E+00**

Notes:

Calculated using the June 2003 version of the Johnson & Eddinger Vapor Intrusion Model.

Groundwater in the vicintiy of MW-26S was evaluated for this subarea of the Rest of BROS property. There were no soils data that fell within the 0-6 ft depth interval that corresponded to this area.

Only chemicals detected with a frequency greater than 5% were included in this analysis. Exposure Point Concentrations were the 95UCLs.

ND: Not detected or not detected at a frequency greater than or equal to 5%.

NA: Could not quantify due to lack of relevant physico-chemical or toxicity data.

ANNEX B
HUMAN HEALTH RISK ASSESSMENT CALCULATIONS

ANNEX B
HUMAN HEALTH RISK ASSESSMENT CALCULATIONS

PREFACE

This annex contains the supporting HHRA risk assessment calculations for the BROS Site. The exposure assumptions are presented in Tables 3-3 through 3-11 of the HHRA Report. The risk calculations are organized the seven receptor groups evaluated in the risk assessment.

List of Tables

Receptor: Trespasser

Receptor: Groundskeeper

Receptor: Construction Worker

Receptor: Utility Worker

Receptor: Resident

Receptor: Agricultural

Receptor: Recreator

Table B-1
Calculation of Potential Risks and Hazard Indices
Trespasser
Surface Soil 0-6 in. AOC-1: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	0.5
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/event)	5353
DAF: Dermal Adherence Factor (mg/cm2)	0.3
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	12
ED: Exposure Duration (years)	8
BW: Body Weight (kg)	50
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2920
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times RAF \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-1 Surface Soil 0-6 in. (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF- adjusted [1/(mg/kg-day)]	Soil Risk- Ingestion	Soil Risk- Dermal	Total Soil Risk
Aluminum	7429-90-5	10300	0.1	0.001	3.39E-05	1.09E-05	1.00E+00	1.00E-01	3.39E-05	1.09E-04	1.43E-04	3.61E-06	1.16E-06	–	–	NC	NC	NC
Arsenic	7440-38-2	7.70	0.95	0.03	2.40E-07	2.44E-07	3.00E-04	3.00E-04	8.02E-04	8.13E-04	1.61E-03	2.57E-08	2.60E-08	1.50E+00	1.50E+00	3.85E-08	3.90E-08	7.75E-08
Chromium	7440-47-3	31.5	0.013	0.001	1.35E-08	3.33E-08	1.50E+00	1.95E-02	8.98E-09	1.71E-06	1.71E-06	1.44E-09	3.55E-09	–	–	NC	NC	NC
Iron	7439-89-6	20800	0.15	0.001	1.03E-04	2.20E-05	3.00E-01	4.50E-02	3.42E-04	4.88E-04	8.30E-04	1.09E-05	2.34E-06	–	–	NC	NC	NC
Manganese	7439-96-5	530	0.04	0.001	6.97E-07	5.60E-07	2.00E-02	8.00E-04	3.48E-05	7.00E-04	7.34E-04	7.43E-08	5.97E-08	–	–	NC	NC	NC
Mercury	7439-97-6	0.09	0.8	0.001	2.39E-09	9.61E-11	–	–	NC	NC	NC	2.55E-10	1.02E-11	–	–	NC	NC	NC
Thallium	7440-28-0	1.30	1	0.001	4.27E-08	1.37E-09	7.00E-05	7.00E-05	6.11E-04	1.96E-05	6.30E-04	4.56E-09	1.46E-10	–	–	NC	NC	NC
Benzo(g,h,i)perylene	191-24-2	0.046	0.89	0.13	1.35E-09	6.31E-09	Request	Request	Request	Request	Request	1.44E-10	6.74E-10	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.051	0.89	0.13	1.49E-09	7.00E-09	Request	Request	Request	Request	Request	1.59E-10	7.47E-10	Request	Request	Request	Request	Request
							Hazard Index:				3.95E-03			Total Cancer Risk:				7.75E-08

Notes:
NC: Risk not calculated. No toxicity value.

800331

Table B-2
Calculation of Potential Risks and Hazard Indices
Trespasser
Surface Soil 0-6 in. AOC-BP: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	0.5
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/event)	5353
DAF: Dermal Adherence Factor (mg/cm2)	0.2
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	12
ED: Exposure Duration (years)	8
BW: Body Weight (kg)	50
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2920
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{\text{CS x IR x FRx OA x EF x ED x CF}}{\text{BW x AT}}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{\text{CS x DAFx SA x RAF x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-BP Surface Soil 0-6 in. (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-adjusted (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Aluminum	7429-90-5	13700	0.1	0.001	4.50E-05	1.45E-05	1.00E+00	1.00E-01	4.50E-05	1.45E-04	1.90E-04	4.80E-06	1.54E-06	--	--	NC	NC	NC
Arsenic	7440-38-2	9.100	0.95	0.03	2.84E-07	2.88E-07	3.00E-04	3.00E-04	9.47E-04	9.61E-04	1.91E-03	3.03E-08	3.07E-08	1.50E+00	1.50E+00	4.55E-08	4.61E-08	9.16E-08
Chromium	7440-47-3	42,100	0.013	0.001	1.80E-08	4.45E-08	1.50E+00	1.95E-02	1.20E-08	2.28E-06	2.29E-06	1.92E-09	4.74E-09	--	--	NC	NC	NC
Iron	7439-89-6	25600	0.15	0.001	1.26E-04	2.70E-05	3.00E-01	4.50E-02	4.21E-04	6.01E-04	1.02E-03	1.35E-05	2.88E-06	--	--	NC	NC	NC
Manganese	7439-96-5	587	0.04	0.001	7.72E-07	6.20E-07	2.00E-02	8.00E-04	3.86E-05	7.75E-04	8.13E-04	8.23E-08	6.61E-08	--	--	NC	NC	NC
Mercury	7439-97-6	0.140	0.8	0.001	3.68E-09	1.48E-10	--	--	NC	NC	NC	3.93E-10	1.58E-11	--	--	NC	NC	NC
Lead	7439-92-1	55.800	0.15	0.001	2.75E-07	5.89E-08	Request	Request	Request	Request	Request	2.94E-08	6.28E-09	Request	Request	Request	Request	Request
Thallium	7440-28-0	3.900	1	0.001	1.28E-07	4.12E-09	7.00E-05	7.00E-05	1.83E-03	5.88E-05	1.89E-03	1.37E-08	4.39E-10	--	--	NC	NC	NC
Vanadium	7440-62-2	62.80	0.026	0.001	5.37E-08	6.63E-08	1.00E-03	2.60E-05	5.37E-05	2.55E-03	2.60E-03	5.73E-09	7.07E-09	--	--	NC	NC	NC
Benzo(a)pyrene	50-32-8	0.073	0.89	0.13	2.14E-09	1.00E-08	--	--	NC	NC	NC	2.28E-10	1.07E-09	7.30E+00	7.30E+00	1.66E-09	7.80E-09	9.47E-09
Benzo(g,h,i)perylene	191-24-2	0.041	0.89	0.13	1.20E-09	5.63E-09	Request	Request	Request	Request	Request	1.28E-10	6.00E-10	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.083	0.89	0.13	2.43E-09	1.14E-08	Request	Request	Request	Request	Request	2.59E-10	1.22E-09	Request	Request	Request	Request	Request
Total PCBs	1336-36-3	0.71	1	0.14	2.33E-08	1.05E-07	2.00E-05	2.00E-05	1.17E-03	5.25E-03	6.42E-03	2.49E-09	1.12E-08	2.00E+00	2.00E+00	4.98E-09	2.24E-08	2.74E-08
							Hazard Index:				1.48E-02			Total Cancer Risk:				1.28E-07

Notes:
NC: Risk not calculated. No toxicity value.

Table B-3
Calculation of Potential Risks and Hazard Indices
Trespasser
Surface Soil 0-6 in. AOC-1: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	50
RPM: Respirable Particulate Matter (ug/m3)	66
InhR: Inhalation Rate (m3/hr)	1.2
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	12
ED: Exposure Duration (years)	8
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2920
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-1 Surface Soil 0-6 in. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Aluminum	7429-90-5	10300	5.36E-07	1.00E-03	5.36E-04	5.72E-08	--	NC
Arsenic	7440-38-2	7.70	4.01E-10	3.00E-04	1.34E-06	4.28E-11	1.51E+01	6.46E-10
Chromium	7440-47-3	31.5	1.64E-09	1.50E+00	1.09E-09	1.75E-10	--	NC
Iron	7439-89-6	20800	1.08E-06	3.00E-01	3.61E-06	1.16E-07	--	NC
Manganese	7439-96-5	530	2.76E-08	1.43E-05	1.93E-03	2.94E-09	--	NC
Mercury	7439-97-6	0.09	4.74E-12	8.60E-05	5.51E-08	5.05E-13	--	NC
Thallium	7440-28-0	1.30	6.77E-11	7.00E-05	9.67E-07	7.22E-12	--	NC
Benzo(g,h,i)perylene	191-24-2	0.046	2.40E-12	Request	Request	2.56E-13	Request	Request
Phenanthrene	85-01-8	0.051	2.66E-12	Request	Request	2.83E-13	Request	Request
			Hazard Index:		2.47E-03	Total Cancer Risk:		6.46E-10

Notes:
NC: Risk not calculated. No toxicity value.

800333

Table B-4
Calculation of Potential Risks and Hazard Indices
Trespasser
Surface Soil 0-6 in. AOC-BP: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	50
RPM: Respirable Particulate Matter (ug/m3)	66
InhR: Inhalation Rate (m3/hr)	1.2
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	12
ED: Exposure Duration (years)	8
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2920
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$ADD\ (mg/kg\text{-}d) = \frac{CS \times RPM \times InhR \times ET \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-BP Surface Soil 0-6 in. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Aluminum	7429-90-5	13700	7.13E-07	1.00E-03	7.13E-04	7.61E-08	--	NC
Arsenic	7440-38-2	9.10	4.74E-10	3.00E-04	1.58E-06	5.05E-11	1.51E+01	7.63E-10
Chromium	7440-47-3	42.10	2.19E-09	1.50E+00	1.46E-09	2.34E-10	--	NC
Iron	7439-89-6	25600	1.33E-06	3.00E-01	4.44E-06	1.42E-07	--	NC
Manganese	7439-96-5	587	3.06E-08	1.43E-05	2.14E-03	3.26E-09	--	NC
Mercury	7439-97-6	0.14	7.29E-12	8.60E-05	8.48E-08	7.78E-13	--	NC
Lead	7439-92-1	55.80	2.91E-09	Request	Request	3.10E-10	Request	Request
Thallium	7440-28-0	3.90	2.03E-10	7.00E-05	2.90E-06	2.17E-11	--	NC
Vanadium	7440-62-2	62.80	3.27E-09	1.00E-03	3.27E-06	3.49E-10	--	NC
Benzo(a)pyrene	50-32-8	0.073	3.80E-12	--	NC	4.06E-13	3.10E+00	1.26E-12
Benzo(g,h,i)perylene	191-24-2	0.041	2.14E-12	Request	Request	2.28E-13	Request	Request
Phenanthrene	85-01-8	0.083	4.32E-12	Request	Request	4.61E-13	Request	Request
Total PCBs	1336-36-3	0.71	3.70E-11	2.00E-05	1.85E-06	3.94E-12	2.00E+00	7.89E-12
					2.87E-03			7.72E-10

Notes:
NC: Risk not calculated. No toxicity value.

800334

Table B-5
Calculation of Potential Risks and Hazard Indices
Groundskeeper (RME)
Surface Soil 0-6 in. AOC-1: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/event)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.1
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	30
ED: Exposure Duration (years)	25
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	9125
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{\text{CS x IR x FRx OA x EF x ED x CF}}{\text{BW x AT}}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{\text{CS x DAFx SA x RAF x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-1 Surface Soil 0-6 in. (mg/kg)	OA	RAF	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Noncancer Hazard Quotient: Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Aluminum	7429-90-5	10300	0.1	0.001	1.18E-04	3.05E-06	1.00E+00	1.00E-01	1.18E-04	3.05E-05	1.48E-04	3.93E-05	1.02E-06	--	--	NC	NC	NC
Arsenic	7440-38-2	7.70	0.95	0.03	8.37E-07	6.83E-08	3.00E-04	3.00E-04	2.79E-03	2.28E-04	3.02E-03	2.79E-07	2.28E-08	1.50E+00	1.50E+00	4.19E-07	3.42E-08	4.53E-07
Chromium	7440-47-3	31.5	0.013	0.001	4.69E-08	9.32E-09	1.50E+00	1.95E-02	3.13E-08	4.78E-07	5.09E-07	1.56E-08	3.11E-09	--	--	NC	NC	NC
Iron	7439-89-6	20800	0.15	0.001	3.57E-04	6.15E-06	3.00E-01	4.50E-02	1.19E-03	1.37E-04	1.33E-03	1.19E-04	2.05E-06	--	--	NC	NC	NC
Benzo(g,h,i)perylene	191-24-2	0.046	0.89	0.13	4.69E-09	1.77E-09	Request	Request	Request	Request	Request	1.56E-09	5.90E-10	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.051	0.89	0.13	5.20E-09	1.96E-09	Request	Request	Request	Request	Request	1.73E-09	6.54E-10	Request	Request	Request	Request	Request
							Hazard Index:				4.50E-03			Total Cancer Risk:				4.53E-07

Notes:
NC: Risk not calculated. No toxicity value.

800335

Table B-6
Calculation of Potential Risks and Hazard Indices
Groundskeeper (RME)
Surface Soil 0-6 in. AOC-BP: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/event)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.1
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	30
ED: Exposure Duration (years)	25
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	9125
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FRx\ OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAFx\ SA \times RAF \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

							Noncancer Hazard Quotient					Excess Lifetime Cancer Risk						
Compound	CASRN	AOC-BP Surface Soil 0-6 in. (mg/kg)	OA	RAF	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Aluminum	7429-90-5	13700	0.1	0.001	1.57E-04	4.05E-06	1.00E+00	1.00E-01	1.57E-04	4.05E-05	1.97E-04	5.23E-05	1.35E-06	--	--	NC	NC	NC
Arsenic	7440-38-2	9.10	0.95	0.03	9.90E-07	8.08E-08	3.00E-04	3.00E-04	3.30E-03	2.69E-04	3.57E-03	3.30E-07	2.69E-08	1.50E+00	1.50E+00	4.95E-07	4.04E-08	5.35E-07
Chromium	7440-47-3	42.10	0.013	0.001	6.27E-08	1.25E-08	1.50E+00	1.95E-02	4.18E-08	6.39E-07	6.80E-07	2.09E-08	4.15E-09	--	--	NC	NC	NC
Iron	7439-89-6	25600	0.15	0.001	4.40E-04	7.57E-06	3.00E-01	4.50E-02	1.47E-03	1.68E-04	1.63E-03	1.47E-04	2.52E-06	--	--	NC	NC	NC
Benzo(g,h,i)perylene	191-24-2	0.041	0.89	0.13	4.18E-09	1.58E-09	Request	Request	Request	Request	Request	1.39E-09	5.26E-10	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.083	0.89	0.13	8.46E-09	3.19E-09	Request	Request	Request	Request	Request	2.82E-09	1.06E-09	Request	Request	Request	Request	Request
							Hazard Index:				5.40E-03			Total Cancer Risk:				5.35E-07

Notes:
NC: Risk not calculated. No toxicity value.

Table B-7
Calculation of Potential Risks and Hazard Indices
Groundskeeper (RME)
Surface Soil 0-6 in. AOC-1: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	66
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	30
ED: Exposure Duration (years)	25
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	9125
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-1 Surface Soil 0-6 in. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Aluminum	7429-90-5	10300	9.34E-06	1.00E-03	9.34E-03	3.11E-06	--	NC
Arsenic	7440-38-2	7.70	6.98E-09	3.00E-04	2.33E-05	2.33E-09	1.51E+01	3.51E-08
Chromium	7440-47-3	31.5	2.86E-08	1.50E+00	1.90E-08	9.52E-09	--	NC
Iron	7439-89-6	20800	1.89E-05	3.00E-01	6.29E-05	6.29E-06	--	NC
Benzo(g,h,i)perylene	191-24-2	0.046	4.17E-11	Request	Request	1.39E-11	Request	Request
Phenanthrene	85-01-8	0.051	4.62E-11	Request	Request	1.54E-11	Request	Request
			Hazard Index:		9.42E-03	Total Cancer Risk:		3.51E-08

Notes:
NC: Risk not calculated. No toxicity value.

800337

Table B-8
Calculation of Potential Risks and Hazard Indices
Groundskeeper (RME)
Surface Soil 0-6 in. AOC-BP: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	66
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	30
ED: Exposure Duration (years)	25
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	9125
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-BP Surface Soil 0-6 in. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Aluminum	7429-90-5	13700	1.24E-05	1.00E-03	1.24E-02	4.14E-06	--	NC
Arsenic	7440-38-2	9.10	8.25E-09	3.00E-04	2.75E-05	2.75E-09	1.51E+01	4.15E-08
Chromium	7440-47-3	42.10	3.82E-08	1.50E+00	2.54E-08	1.27E-08	--	NC
Iron	7439-89-6	25600	2.32E-05	3.00E-01	7.74E-05	7.74E-06	--	NC
Benzo(g,h,i)perylene	191-24-2	0.041	3.72E-11	Request	Request	1.24E-11	Request	Request
Phenanthrene	85-01-8	0.083	7.53E-11	Request	Request	2.51E-11	Request	Request
			Hazard Index:		1.25E-02	Total Cancer Risk:		4.15E-08

Notes:
NC: Risk not calculated. No toxicity value.

Table B-9
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Surface Soil 0-6 in. AOC-1: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	RME Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
DA: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	80
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times DA \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-1 Surface Soil 0 6 in. (mg/kg)	OA	DA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF- adjusted [1/(mg/kg-day)]	Soil Risk- Ingestion	Soil Risk- Dermal	Total Soil Risk
Aluminum	7429-90-5	10300	0.1	0.001	3.14E-04	2.44E-05	1.00E+00	1.00E-01	3.14E-04	2.44E-04	5.58E-04	4.19E-06	3.25E-07	--	--	NC	NC	NC
Arsenic	7440-38-2	7.70	0.95	0.03	2.23E-06	5.47E-07	3.00E-04	3.00E-04	7.44E-03	1.82E-03	9.27E-03	2.98E-08	7.29E-09	1.50E+00	1.50E+00	4.47E-08	1.09E-08	5.56E-08
Chromium	7440-47-3	31.5	0.013	0.001	1.25E-07	7.45E-08	1.50E+00	1.95E-02	8.33E-08	3.82E-06	3.91E-06	1.67E-09	9.94E-10	--	--	NC	NC	NC
Iron	7439-89-6	20800	0.15	0.001	9.52E-04	4.92E-05	3.00E-01	4.50E-02	3.17E-03	1.09E-03	4.27E-03	1.27E-05	6.56E-07	--	--	NC	NC	NC
Benzo(g,h,i)perylene	191-24-2	0.046	0.89	0.13	1.25E-08	1.42E-08	Request	Request	Request	Request	Request	1.67E-10	1.89E-10	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.051	0.89	0.13	1.39E-08	1.57E-08	Request	Request	Request	Request	Request	1.85E-10	2.09E-10	Request	Request	Request	Request	Request
							Hazard Index:				1.41E-02			Total Cancer Risk:				5.56E-08

Notes:
NC: Risk not calculated. No toxicity value.

Using a soil ingestion rate of 330 mg/day (from the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites; USEPA, 2001d), and soil dermal adherence factor of 0.2 mg/cm2 (USEPA, 2004a), would result increase the ADD and risks from the ingestion pathway by a factor of 3.3x, and decrease the ADD and risk from the dermal pathway, by a factor of 4.5 times relative to those shown in this table. The total soil cancer and non-cancer risks would still be below the threshold values.

800339

Table B-10
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Surface Soil 0-6 in. AOC-2: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
DA: Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	80
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr. cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr. noncancer)	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAFx\ SA \times DA \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-2 Surface Soil 0 6 in. (mg/kg)	OA	DA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk Ingestion	Soil Risk- Dermal	Total Soil Risk
Arsenic	7440-38-2	5.70	0.95	0.03	1.65E-06	4.05E-07	3.00E-04	3.00E-04	5.51E-03	1.35E-03	6.86E-03	2.20E-08	5.40E-09	1.50E+00	1.50E+00	3.31E-08	8.09E-09	4.12E-08
Iron	7439-89-6	13400	0.15	0.001	6.14E-04	3.17E-05	3.00E-01	4.50E-02	2.05E-03	7.05E-04	2.75E-03	8.18E-06	4.23E-07	--	--	NC	NC	NC
Benzo(a)pyrene	50-32-8	0.34	0.89	0.13	9.24E-08	1.05E-07	--	--	NC	NC	NC	1.23E-09	1.39E-09	7.30E+00	7.30E+00	8.99E-09	1.02E-08	1.92E-08
Benzo(g,h,i)perylene	191-24-2	0.18	0.89	0.13	4.89E-08	5.54E-08	Request	Request	Request	Request	Request	6.52E-10	7.38E-10	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.33	0.89	0.13	8.97E-08	1.02E-07	Request	Request	Request	Request	Request	1.20E-09	1.35E-09	Request	Request	Request	Request	Request
Total PCBs	1336-36-3	0.45	1	0.14	1.37E-07	1.49E-07	2.00E-05	2.00E-05	6.87E-03	7.45E-03	1.43E-02	1.83E-09	1.99E-09	2.00E+00	2.00E+00	3.66E-09	3.98E-09	7.64E-09
							Hazard Index:				2.39E-02			Total Cancer Risk:				6.80E-08

Notes:

NC: Risk not calculated. No toxicity value.

Using a soil ingestion rate of 330 mg/day (from the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites; USEPA, 2001d), and soil dermal adherence factor of 0.2 mg/cm2 (USEPA, 2004a), would result increase the ADD and risks from the ingestion pathway by a factor of 3.3x, and decrease the ADD and risk from the dermal pathway, by a factor of 4.5 times relative to those shown in this table. The total soil cancer and non-cancer risks would still be below the threshold values.

800340

Table B-11
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-6 ft. AOC-1: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
DA: Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	20
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times DA \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-1 Subsurface Soil 0-6 ft. (mg/kg)	OA	DA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Aluminum	7429-90-5	12200	0.1	0.001	9.31E-05	7.22E-06	1.00E+00	1.00E-01	9.31E-05	7.22E-05	1.65E-04	1.24E-06	9.62E-08	--	--	NC	NC	NC
Arsenic	7440-38-2	20	0.95	0.03	1.45E-06	3.55E-07	3.00E-04	3.00E-04	4.83E-03	1.18E-03	6.02E-03	1.93E-08	4.73E-09	1.50E+00	1.50E+00	2.90E-08	7.10E-09	3.61E-08
Chromium	7440-47-3	140	0.013	0.001	1.39E-07	8.28E-08	1.50E+00	1.95E-02	9.26E-08	4.25E-06	4.34E-06	1.85E-09	1.10E-09	--	--	NC	NC	NC
Iron	7439-89-6	29100	0.15	0.001	3.33E-04	1.72E-05	3.00E-01	4.50E-02	1.11E-03	3.83E-04	1.49E-03	4.44E-06	2.30E-07	--	--	NC	NC	NC
Lead	7439-92-1	537	0.15	0.001	6.15E-06	3.18E-07	Request	Request	Request	Request	Request	8.20E-08	4.24E-09	Request	Request	Request	Request	Request
Acenaphthylene	208-96-8	0.4	0.89	0.13	2.72E-08	3.08E-08	Request	Request	Request	Request	Request	3.62E-10	4.10E-10	Request	Request	Request	Request	Request
Benzo(g,h,i)perylene	191-24-2	0.046	0.89	0.13	3.12E-09	3.54E-09	Request	Request	Request	Request	Request	4.17E-11	4.72E-11	Request	Request	Request	Request	Request
Naphthalene	91-20-3	19	0.89	0.13	1.29E-06	1.46E-06	2.00E-02	2.00E-02	6.45E-05	7.31E-05	1.38E-04	1.72E-08	1.95E-08	--	--	NC	NC	NC
Phenanthrene	85-01-8	7.2	0.89	0.13	4.89E-07	5.54E-07	Request	Request	Request	Request	Request	6.52E-09	7.38E-09	Request	Request	Request	Request	Request
Total PCBs	1336-36-3	11.06	1	0.14	8.44E-07	9.16E-07	2.00E-05	2.00E-05	4.22E-02	4.58E-02	8.80E-02	1.13E-08	1.22E-08	2.00E+00	2.00E+00	2.25E-08	2.44E-08	4.69E-08
							Hazard Index:				9.58E-02			Total Cancer Risk:				8.30E-08

Notes:
NC: Risk not calculated. No toxicity value.
Using a soil ingestion rate of 330 mg/day (from the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites; USEPA, 2001d), and soil dermal adherence factor of 0.2 mg/cm2 (USEPA, 2004a), would result increase the ADD and risks from the ingestion pathway by a factor of 3.3x, and decrease the ADD and risk from the dermal pathway, by a factor of 4.5 times relative to those shown in this table. The total soil cancer and non-cancer risks would still be below the threshold values.

800341

Table B-12
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-6 ft. AOC-2: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.3
DA: Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	20
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times DA \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-2 Subsurface Soil 0-6 ft. (mg/kg)	OA	DA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk- Ingestion	Soil Risk- Dermal	Total Soil Risk
Arsenic	7440-38-2	5.70	0.95	0.03	4.13E-07	1.01E-07	3.00E-04	3.00E-04	1.38E-03	3.37E-04	1.71E-03	5.51E-09	1.35E-09	1.50E+00	1.50E+00	8.26E-09	2.02E-09	1.03E-08
Iron	7439-89-6	13400	0.15	0.001	1.53E-04	7.93E-06	3.00E-01	4.50E-02	5.11E-04	1.76E-04	6.87E-04	2.05E-06	1.06E-07	--	--	NC	NC	NC
Lead	7439-92-1	244	0.15	0.001	2.79E-06	1.44E-07	Request	Request	Request	Request	Request	3.72E-08	1.92E-09	Request	Request	Request	Request	Request
Acenaphthylene	208-96-8	0.23	0.89	0.13	1.56E-08	1.77E-08	Request	Request	Request	Request	Request	2.08E-10	2.36E-10	Request	Request	Request	Request	Request
Benzo(a)pyrene	50-32-8	0.34	0.89	0.13	2.31E-08	2.61E-08	--	--	NC	NC	NC	3.08E-10	3.49E-10	7.30E+00	7.30E+00	2.25E-09	2.55E-09	4.79E-09
Benzo(g,h,i)perylene	191-24-2	0.18	0.89	0.13	1.22E-08	1.38E-08	Request	Request	Request	Request	Request	1.63E-10	1.85E-10	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	4.1	0.89	0.13	2.78E-07	3.15E-07	Request	Request	Request	Request	Request	3.71E-09	4.20E-09	Request	Request	Request	Request	Request
Total PCBs	1336-36-3	3.01	1	0.14	2.30E-07	2.49E-07	2.00E-05	2.00E-05	1.15E-02	1.25E-02	2.40E-02	3.06E-09	3.32E-09	2.00E+00	2.00E+00	6.13E-09	6.65E-09	1.28E-08
							Hazard Index:				2.64E-02			Total Cancer Risk:				2.79E-08

Notes:
NC: Risk not calculated. No toxicity value.
Using a soil ingestion rate of 330 mg/day (from the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites; USEPA, 2001d), and soil dermal adherence factor of 0.2 mg/cm2 (USEPA, 2004a), would result increase the ADD and risks from the ingestion pathway by a factor of 3.3x, and decrease the ADD and risk from the dermal pathway, by a factor of 4.5 times relative to those shown in this table. The total soil cancer and non-cancer risks would still be below the threshold values.

800342

Table B-13
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-6 ft. AOC-3: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
DA: Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	20
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times DA \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-3 Subsurface Soil 0-6 ft. (mg/kg)	OA	DA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-adjusted (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Arsenic	7440-38-2	3	0.95	0.03	2.17E-07	5.32E-08	3.00E-04	3.00E-04	7.25E-04	1.77E-04	9.02E-04	2.90E-09	7.10E-10	1.50E+00	1.50E+00	4.35E-09	1.06E-09	5.41E-09
Benzo(g,h,i)perylene	191-24-2	0.058	0.89	0.13	3.94E-09	4.46E-09	Request	Request	Request	Request	Request	5.25E-11	5.95E-11	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.43	0.89	0.13	2.92E-08	3.31E-08	Request	Request	Request	Request	Request	3.89E-10	4.41E-10	Request	Request	Request	Request	Request
							Hazard Index:				9.02E-04			Total Cancer Risk:				5.41E-09

Notes:

NC: Risk not calculated. No toxicity value.

Using a soil ingestion rate of 330 mg/day (from the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites; USEPA, 2001d), and soil dermal adherence factor of 0.2 mg/cm^2(USEPA, 2004a), would result increase the ADD and risks from the ingestion pathway by a factor of 3.3x, and decrease the ADD and risk from the dermal pathway, by a factor of 4.5 times relative to those shown in this table. The total soil cancer and non-cancer risks would still be below the threshold values.

800343

Table B-14
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-6 ft. AOC-4: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
DA: Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	20
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times DA \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-4 Subsurface Soil 0-6 ft. (mg/kg)	OA	DA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Arsenic	7440-38-2	1.80	0.95	0.03	1.30E-07	3.19E-08	3.00E-04	3.00E-04	4.35E-04	1.06E-04	5.41E-04	1.74E-09	4.26E-10	1.50E+00	1.50E+00	2.61E-09	6.39E-10	3.25E-09
							Hazard Index:				5.41E-04			Total Cancer Risk:				3.25E-09

Notes:
NC: Risk not calculated. No toxicity value.
Using a soil ingestion rate of 330 mg/day (from the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites; USEPA, 2001d), and soil dermal adherence factor of 0.2 mg/cm^2 (USEPA, 2004a), would result increase the ADD and risks from the ingestion pathway by a factor of 3.3x, and decrease the ADD and risk from the dermal pathway, by a factor of 4.5 times relative to those shown in this table. The total soil cancer and non-cancer risks would still be below the threshold values.

800344

Table B-15
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-6 ft. AOC-5: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
DA: Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	20
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times DA \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-5 Subsurface Soil 0-6 ft. (mg/kg)	OA	DA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk- Ingestion	Soil Risk- Dermal	Total Soil Risk
Arsenic	7440-38-2	2.40	0.95	0.03	1.74E-07	4.26E-08	3.00E-04	3.00E-04	5.80E-04	1.42E-04	7.22E-04	2.32E-09	5.68E-10	1.50E+00	1.50E+00	3.48E-09	8.52E-10	4.33E-09
							Hazard Index:				7.22E-04			Total Cancer Risk:				4.33E-09

Notes:
NC: Risk not calculated. No toxicity value.

Using a soil ingestion rate of 330 mg/day (from the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites; USEPA, 2001d), and soil dermal adherence factor of 0.2 mg/cm^2 (USEPA, 2004a), would result increase the ADD and risks from the ingestion pathway by a factor of 3.3x, and decrease the ADD and risk from the dermal pathway, by a factor of 4.5 times relative to those shown in this table. The total soil cancer and non-cancer risks would still be below the threshold values.

800345

Table B-16
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-7 ft. AOC-6: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
DA: Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	20
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FRx\ OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAFx\ SA \times DA \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-6 Subsurface Soil 0-7 ft. (mg/kg)	OA	DA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-adjusted (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Arsenic	7440-38-2	1.2	0.95	0.03	8.70E-08	2.13E-08	3.00E-04	3.00E-04	2.90E-04	7.10E-05	3.61E-04	1.16E-09	2.84E-10	1.50E+00	1.50E+00	1.74E-09	4.26E-10	2.17E-09
Benzo(a)pyrene	50-32-8	0.25	0.89	0.13	1.70E-08	1.92E-08	--	--	NC	NC	NC	2.26E-10	2.56E-10	7.30E+00	7.30E+00	1.65E-09	1.87E-09	3.52E-09
Benzo(g,h,i)perylene	191-24-2	0.082	0.89	0.13	5.57E-09	6.31E-09	Request	Request	Request	Request	Request	7.43E-11	8.41E-11	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	6.5	0.89	0.13	4.41E-07	5.00E-07	Request	Request	Request	Request	Request	5.89E-09	6.67E-09	Request	Request	Request	Request	Request
Ethylbenzene	100-41-4	25	0.97	NA	1.85E-06	NC	1.00E-01	1.00E-01	1.85E-05	NC	1.85E-05	2.47E-08	NA	--	--	NC	NC	NC
Xylenes (Total)	1330-20-7	73	0.92	NA	5.13E-06	NC	2.00E-01	2.00E-01	2.56E-05	NC	2.56E-05	6.83E-08	NA	--	--	NC	NC	NC
Total PCBs	1336-36-3	16	1	0.14	1.22E-06	1.33E-06	2.00E-05	2.00E-05	6.11E-02	6.63E-02	1.27E-01	1.63E-08	1.77E-08	2.00E+00	2.00E+00	3.26E-08	3.53E-08	6.79E-08
							Hazard Index:				1.28E-01			Total Cancer Risk:				7.36E-08

Notes:
NC: Risk not calculated. No toxicity value.
Using a soil ingestion rate of 330 mg/day (from the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites; USEPA, 2001d), and soil dermal adherence factor of 0.2 mg/cm^2(USEPA, 2004a), would result increase the ADD and risks from the ingestion pathway by a factor of 3.3x, and decrease the ADD and risk from the dermal pathway, by a factor of 4.5 times relative to those shown in this table. The total soil cancer and non-cancer risks would still be below the threshold values.

800346

Table B-17
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Surface Soil 0-6 in. AOC-BP: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
DA: Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	80
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times DA \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-BP Surface Soil 0 6 in. (mg/kg)	OA	DA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk Ingestion	Soil Risk Dermal	Total Soil Risk
Aluminum	7429-90-5	13700	0.1	0.001	4.18E-04	3.24E-05	1.00E+00	1.00E-01	4.18E-04	3.24E-04	7.42E-04	5.58E-06	4.32E-07	--	--	NC	NC	NC
Arsenic	7440-38-2	9.10	0.95	0.03	2.64E-06	6.46E-07	3.00E-04	3.00E-04	8.80E-03	2.15E-03	1.10E-02	3.52E-08	8.61E-09	1.50E+00	1.50E+00	5.28E-08	1.29E-08	6.57E-08
Chromium	7440-47-3	42.10	0.013	0.001	1.67E-07	9.96E-08	1.50E+00	1.95E-02	1.11E-07	5.11E-06	5.22E-06	2.23E-09	1.33E-09	--	--	NC	NC	NC
Iron	7439-89-6	25600	0.15	0.001	1.17E-03	6.06E-05	3.00E-01	4.50E-02	3.91E-03	1.35E-03	5.25E-03	1.56E-05	8.08E-07	--	--	NC	NC	NC
Benzo(g,h,i)perylene	191-24-2	0.041	0.89	0.13	1.11E-08	1.26E-08	Request	Request	Request	Request	Request	1.49E-10	1.68E-10	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.083	0.89	0.13	2.25E-08	2.55E-08	Request	Request	Request	Request	Request	3.01E-10	3.40E-10	Request	Request	Request	Request	Request
							Hazard Index:				1.70E-02			Total Cancer Risk:				6.57E-08

Notes:
NC: Risk not calculated. No toxicity value.

Using a soil ingestion rate of 330 mg/day (from the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites; USEPA, 2001d), and soil dermal adherence factor of 0.2 mg/cm^2(USEPA, 2004a), would result increase the ADD and risks from the ingestion pathway by a factor of 3.3x, and decrease the ADD and risk from the dermal pathway, by a factor of 4.5 times relative to those shown in this table. The total soil cancer and non-cancer risks would still be below the threshold values.

Table B-18
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-6 ft. AOC-BP: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
DA: Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	20
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{\text{CS x IR x FRx OA x EF x ED x CF}}{\text{BW x AT}}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{\text{CS x DAFx SA x DA x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-BP Subsurface Soil 0-6 ft. (mg/kg)	OA	DA	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Noncancer Hazard Quotient: Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Aluminum	7429-90-5	8442.08	0.1	0.001	6.44E-05	4.99E-06	1.00E+00	1.00E-01	6.44E-05	4.99E-05	1.14E-04	8.59E-07	6.66E-08	--	--	NC	NC	NC
Arsenic	7440-38-2	66.76	0.95	0.03	4.84E-06	1.18E-06	3.00E-04	3.00E-04	1.61E-02	3.95E-03	2.01E-02	6.45E-08	1.58E-08	1.50E+00	1.50E+00	9.68E-08	2.37E-08	1.21E-07
Chromium	7440-47-3	66.76	0.013	0.001	6.62E-08	3.95E-08	1.50E+00	1.95E-02	4.42E-08	2.03E-06	2.07E-06	8.83E-10	5.27E-10	--	--	NC	NC	NC
Iron	7439-89-6	25600	0.15	0.001	2.93E-04	1.51E-05	3.00E-01	4.50E-02	9.77E-04	3.37E-04	1.31E-03	3.91E-06	2.02E-07	--	--	NC	NC	NC
Lead	7439-92-1	83.98	0.15	0.001	9.61E-07	4.97E-08	Request	Request	Request	Request	Request	1.28E-08	6.62E-10	Request	Request	Request	Request	Request
Acenaphthylene	208-96-8	0.06	0.89	0.13	4.30E-09	4.87E-09	Request	Request	Request	Request	Request	5.74E-11	6.49E-11	Request	Request	Request	Request	Request
Benzo(a)pyrene	50-32-8	0.13	0.89	0.13	8.94E-09	1.01E-08	--	--	NC	NC	NC	1.19E-10	1.35E-10	7.30E+00	7.30E+00	8.70E-10	9.85E-10	1.85E-09
Benzo(g,h,i)perylene	191-24-2	0.09	0.89	0.13	5.83E-09	6.60E-09	Request	Request	Request	Request	Request	7.77E-11	8.80E-11	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.44	0.89	0.13	2.98E-08	3.38E-08	Request	Request	Request	Request	Request	3.97E-10	4.50E-10	Request	Request	Request	Request	Request
Total PCBs	1336-36-3	9.8	1	0.14	7.48E-07	8.12E-07	2.00E-05	2.00E-05	3.74E-02	4.06E-02	7.80E-02	9.97E-09	1.08E-08	2.00E+00	2.00E+00	1.99E-08	2.16E-08	4.16E-08
							Hazard Index:				9.95E-02			Total Cancer Risk:				1.64E-07

Notes:
NC: Risk not calculated. No toxicity value.
Using a soil ingestion rate of 330 mg/day (from the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites; USEPA, 2001d), and soil dermal adherence factor of 0.2 mg/cm^2(USEPA, 2004a), would result increase the ADD and risks from the ingestion pathway by a factor of 3.3x, and decrease the ADD and risk from the dermal pathway, by a factor of 4.5 times relative to those shown in this table. The total soil cancer and non-cancer risks would still be below the threshold values.

800348

Table B-19
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-6 ft. AOC-1: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	150
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	80
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-1 Subsurface Soil 0-6 ft. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Aluminum	7429-90-5	12200	6.70E-05	1.00E-03	6.70E-02	8.94E-07	--	NC
Arsenic	7440-38-2	20	1.10E-07	3.00E-04	3.66E-04	1.47E-09	1.51E+01	2.21E-08
Chromium	7440-47-3	140	7.69E-07	1.50E+00	5.13E-07	1.03E-08	--	NC
Iron	7439-89-6	29100	1.60E-04	3.00E-01	5.33E-04	2.13E-06	--	NC
Lead	7439-92-1	537	2.95E-06	Request	Request	3.93E-08	Request	Request
Acenaphthylene	208-96-8	0.4	2.20E-09	Request	Request	2.93E-11	Request	Request
Benzo(g,h,i)perylene	191-24-2	0.046	2.53E-10	Request	Request	3.37E-12	Request	Request
Naphthalene	91-20-3	19	1.04E-07	9.00E-04	1.16E-04	1.39E-09	--	NC
Phenanthrene	85-01-8	7.2	3.96E-08	Request	Request	5.27E-10	Request	Request
Total PCBs	1336-36-3	11.06	6.08E-08	2.00E-05	3.04E-03	8.10E-10	2.00E+00	1.62E-09
			Hazard Index:		7.11E-02	Total Cancer Risk:		2.37E-08

Notes:
NC: Risk not calculated. No toxicity value.

800349

Table B-20
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-6 ft. AOC-2: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	150
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	80
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-2 Subsurface Soil 0-6 ft. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Arsenic	7440-38-2	5.70	3.13E-08	3.00E-04	1.04E-04	4.18E-10	1.51E+01	6.31E-09
Iron	7439-89-6	13400	7.36E-05	3.00E-01	2.45E-04	9.82E-07	--	NC
Lead	7439-92-1	244	1.34E-06	Request	Request	1.79E-08	Request	Request
Acenaphthylene	208-96-8	0.23	1.26E-09	Request	Request	1.69E-11	Request	Request
Benzo(a)pyrene	50-32-8	0.34	1.87E-09	--	NC	2.49E-11	3.10E+00	7.72E-11
Benzo(g,h,i)perylene	191-24-2	0.18	9.89E-10	Request	Request	1.32E-11	Request	Request
Phenanthrene	85-01-8	4.1	2.25E-08	Request	Request	3.00E-10	Request	Request
Total PCBs	1336-36-3	3.01	1.65E-08	2.00E-05	8.27E-04	2.21E-10	2.00E+00	4.41E-10
			Hazard Index:		1.18E-03	Total Cancer Risk:		6.82E-09

Notes:
NC: Risk not calculated. No toxicity value.

800350

Table B-21
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-6 ft. AOC-3: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	150
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	80
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-3 Subsurface Soil 0-6 ft. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Arsenic	7440-38-2	3	1.65E-08	3.00E-04	5.49E-05	2.20E-10	1.51E+01	3.32E-09
Benzo(g,h,i)perylene	191-24-2	0.058	3.19E-10	Request	Request	4.25E-12	Request	Request
Phenanthrene	85-01-8	0.43	2.36E-09	Request	Request	3.15E-11	Request	Request
			Hazard Index:		5.49E-05	Total Cancer Risk:		3.32E-09

Notes:
NC: Risk not calculated. No toxicity value.

Table B-22
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-6 ft. AOC-4: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	150
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	80
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-4 Subsurface Soil 0-6 ft. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Arsenic	7440-38-2	1.80	9.89E-09	3.00E-04	3.30E-05	1.32E-10	1.51E+01	1.99E-09
			Hazard Index:		3.30E-05	Total Cancer Risk:		1.99E-09

Notes:
NC: Risk not calculated. No toxicity value.

800352

Table B-23
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-6 ft. AOC-5: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	150
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	80
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-5 Subsurface Soil 0-6 ft. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Arsenic	7440-38-2	2.40	1.32E-08	3.00E-04	4.40E-05	1.76E-10	1.51E+01	2.66E-09
			Hazard Index:		4.40E-05	Total Cancer Risk:		2.66E-09

Notes:
NC: Risk not calculated. No toxicity value.

800353

Table B-24
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-7 ft. AOC-6: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	150
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	80
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-6 Subsurface Soil 0-7 ft. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Arsenic	7440-38-2	1.2	6.59E-09	3.00E-04	2.20E-05	8.79E-11	1.51E+01	1.33E-09
Benzo(a)pyrene	50-32-8	0.25	1.37E-09	--	NC	1.83E-11	3.10E+00	5.68E-11
Benzo(g,h,i)perylene	191-24-2	0.082	4.51E-10	Request	Request	6.01E-12	Request	Request
Phenanthrene	85-01-8	6.5	3.57E-08	Request	Request	4.76E-10	Request	Request
Ethylbenzene	100-41-4	25	1.37E-07	2.90E-01	4.74E-07	1.83E-09	--	NC
Xylenes (Total)	1330-20-7	73	4.01E-07	3.00E-02	1.34E-05	5.35E-09	--	NC
Total PCBs	1336-36-3	16	8.79E-08	2.00E-05	4.40E-03	1.17E-09	2.00E+00	2.34E-09
			Hazard Index:		4.43E-03	Total Cancer Risk:		3.73E-09

Notes:
NC: Risk not calculated. No toxicity value.

800354

Table B-25
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Subsurface Soil 0-6 ft. AOC-BP: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	150
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	80
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-BP Subsurface Soil 0-6 ft. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Aluminum	7429-90-5	8442.08	4.64E-05	1.00E-03	4.64E-02	6.18E-07	--	NC
Arsenic	7440-38-2	66.76	3.67E-07	3.00E-04	1.22E-03	4.89E-09	1.51E+01	7.39E-08
Chromium	7440-47-3	66.76	3.67E-07	1.50E+00	2.45E-07	4.89E-09	--	NC
Iron	7439-89-6	25600	1.41E-04	3.00E-01	4.69E-04	1.88E-06	--	NC
Lead	7439-92-1	83.98	4.61E-07	Request	Request	6.15E-09	Request	Request
Acenaphthylene	208-96-8	0.06	3.48E-10	Request	Request	4.64E-12	Request	Request
Benzo(a)pyrene	50-32-8	0.13	7.23E-10	--	NC	9.64E-12	3.10E+00	2.99E-11
Benzo(g,h,i)perylene	191-24-2	0.09	4.71E-10	Request	Request	6.28E-12	Request	Request
Phenanthrene	85-01-8	0.44	2.41E-09	Request	Request	3.22E-11	Request	Request
Total PCBs	1336-36-3	9.80	5.38E-08	2.00E-05	2.69E-03	7.18E-10	2.00E+00	1.44E-09
			Hazard Index:		5.08E-02	Total Cancer Risk:		7.53E-08

Notes:
NC: Risk not calculated. No toxicity value.

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Table B-26a
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Ground water AOC-1a: Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	NA
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	NA
SA: Skin Surface Area (cm2)	1980
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	4
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$

ADD-Dermal (mg/kg-day) = $\frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

					Noncancer Hazard Quotient							Excess Lifetime Cancer Risk					
Compound	CASRN	AOC-1a Ground water (mg/L)	Kp (cm/hr)	OA Chronic	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Oral (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF 1/(mg/kg-day)	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestio	GW Risk-Dermal	Total GW Risk
Aluminum	7429-90-5	524	0.00214	0.1	NA	3.39E-04	1.00E+00	1.00E-01	NA	3.39E-03	3.39E-03	NA	4.52E-06	--	--	NA	NC	NC
Arsenic	7440-38-2	0.093	0.00193	0.95	NA	5.44E-08	3.00E-04	3.00E-04	NA	1.81E-04	1.81E-04	NA	7.26E-10	1.50E+00	1.50E+00	NA	1.09E-09	1.09E-09
Barium	7440-39-3	0.297	0.000403	0.07	NA	3.61E-08	7.00E-02	4.90E-03	NA	7.37E-06	7.37E-06	NA	4.82E-10	--	--	NA	NC	NC
Beryllium	7440-41-7	0.021	0.00066	0.007	NA	4.16E-09	2.00E-03	1.40E-05	NA	2.97E-04	2.97E-04	NA	5.55E-11	--	--	NA	NC	NC
Chromium	7440-47-3	1.090	0.001	0.013	NA	3.29E-07	1.50E+00	1.95E-02	NA	1.69E-05	1.69E-05	NA	4.39E-09	--	--	NA	NC	NC
Cobalt	7440-48-4	0.139	0.0004	0.8	NA	1.68E-08	2.00E-02	2.00E-02	NA	8.42E-07	8.42E-07	NA	2.25E-10	--	--	NA	NC	NC
Copper	7440-50-8	0.068	0.000307	0.3	NA	6.33E-09	4.00E-02	1.20E-02	NA	5.28E-07	5.28E-07	NA	8.44E-11	--	--	NA	NC	NC
Lead	7439-92-1	0.313	0.0001	0.15	NA	9.46E-09	Request	Request	NA	Request	Request	NA	1.26E-10	Request	Request	NA	Request	Request
Mercury	7439-97-6	0.0002	0.001	0.8	NA	4.54E-11	--	--	NA	NC	NC	NA	6.05E-13	--	--	NA	NC	NC
Nickel	7440-02-0	2.075	0.0002	0.04	NA	1.25E-07	2.00E-02	8.00E-04	NA	1.57E-04	1.57E-04	NA	1.67E-09	--	--	NA	NC	NC
Selenium	7782-49-2	0.052	0.000903	0.8	NA	1.41E-08	5.00E-03	5.00E-03	NA	2.82E-06	2.82E-06	NA	1.88E-10	--	--	NA	NC	NC
Thallium	7440-28-0	0.106	0.000157	1	NA	5.03E-09	7.00E-05	7.00E-05	NA	7.18E-05	7.18E-05	NA	6.70E-11	--	--	NA	NC	NC
Vanadium	7440-62-2	2.700	0.00135	0.026	NA	1.10E-06	1.00E-03	2.60E-05	NA	4.24E-02	4.24E-02	NA	1.47E-08	--	--	NA	NC	NC
Zinc	7440-66-6	1.640	0.0006	0.2	NA	2.97E-07	3.00E-01	6.00E-02	NA	4.96E-06	4.96E-06	NA	3.96E-09	--	--	NA	NC	NC
2,4-Dimethylphenol	105-67-9	0.150	0.011	0.5	NA	4.99E-07	2.00E-02	2.00E-02	NA	2.49E-05	2.49E-05	NA	6.65E-09	--	--	NA	NC	NC
2-Methylnapthalene	91-57-6	0.027	0.142	0.8	NA	1.17E-06	2.00E-02	2.00E-02	NA	5.84E-05	5.84E-05	NA	1.56E-08	--	--	NA	NC	NC
3-Nitroaniline	99-09-2	0.001	0.00257	0.8	NA	1.12E-09	3.00E-04	3.00E-04	NA	3.72E-06	3.72E-06	NA	1.49E-11	2.00E-02	2.00E-02	NA	2.98E-13	2.98E-13
4-Chloro-3-methylphenol	59-50-7	0.001	0.029	0.5	NA	6.76E-09	Request	Request	NA	Request	Request	NA	1.17E-10	Request	Request	NA	Request	Request
4-Chloroaniline	106-47-8	0.292	0.00633	0.5	NA	5.58E-07	4.00E-03	4.00E-03	NA	1.39E-04	1.39E-04	NA	7.44E-09	5.40E-02	5.40E-02	NA	4.02E-10	4.02E-10
4-Methyl-2-pentanone	108-10-1	0.226	0.00397	0.8	NA	2.72E-07	8.00E-02	8.00E-02	NA	3.39E-06	3.39E-06	NA	3.62E-09	--	--	NA	NC	NC
Acenaphthylene	208-96-8	0.002	0.141	0.89	NA	6.96E-08	Request	Request	NA	Request	Request	NA	9.29E-10	Request	Request	NA	Request	Request
Benzo(a)anthracene	56-55-3	0.001	0.47	0.89	NA	1.16E-07	--	--	NA	NC	NC	NA	1.56E-09	7.30E-01	7.30E-01	NA	1.15E-09	1.15E-09
Benzo(a)pyrene	50-32-8	0.001	0.7	0.89	NA	1.76E-07	--	--	NA	NC	NC	NA	2.35E-09	7.30E+00	7.30E+00	NA	1.71E-08	1.71E-08
Benzo(b)fluoranthene	205-99-2	0.001	0.7	0.89	NA	1.52E-07	--	--	NA	NC	NC	NA	2.02E-09	7.30E-01	7.30E-01	NA	1.48E-09	1.48E-09
Benzo(g,h,i)perylene	191-24-2	0.001	2	0.89	NA	4.33E-07	Request	Request	NA	Request	Request	NA	5.78E-09	Request	Request	NA	Request	Request
bis(2-Chloroethyl)ether	111-44-4	1.800	0.0018	0.5	NA	9.79E-07	--	--	NA	NC	NC	NA	1.31E-08	1.10E+00	1.10E+00	NA	1.44E-08	1.44E-08
bis(2-Ethylhexyl)phthalate	117-81-7	0.007	1.97	0.19	NA	4.42E-06	2.00E-02	3.80E-03	NA	1.16E-03	1.16E-03	NA	5.90E-06	1.40E-02	7.40E-02	NA	4.36E-09	4.36E-09
Dibenzofuran	132-64-9	0.001	0.151	0.8	NA	4.10E-08	2.00E-03	2.00E-03	NA	2.05E-05	2.05E-05	NA	5.47E-10	--	--	NA	NC	NC
Indeno(1,2,3-cd)pyrene	193-39-5	0.001	1	0.89	NA	1.76E-07	--	--	NA	NC	NC	NA	2.34E-09	7.30E-01	7.30E-01	NA	1.71E-09	1.71E-09
Isophorone	78-59-1	0.109	0.0034	0.5	NA	1.12E-07	2.00E-01	2.00E-01	NA	5.59E-07	5.59E-07	NA	1.49E-09	9.50E-04	9.50E-04	NA	1.42E-12	1.42E-12
Naphthalene	91-20-3	0.124	0.047	0.89	NA	1.76E-06	2.00E-02	2.00E-02	NA	8.78E-05	8.78E-05	NA	2.34E-08	--	--	NA	NC	NC
Phenanthrene	85-01-8	0.011	0.14	0.89	NA	4.62E-07	Request	Request	NA	Request	Request	NA	6.16E-09	Request	Request	NA	Request	Request
1,1,1-Trichloroethane	71-55-6	0.038	0.013	0.9	NA	1.48E-07	2.80E-01	2.80E-01	NA	5.30E-07	5.30E-07	NA	1.98E-09	--	--	NA	NC	NC
1,1-Dichloroethane	75-34-3	0.094	0.0067	1	NA	1.89E-07	1.00E-01	1.00E-01	NA	1.89E-06	1.89E-06	NA	2.53E-09	--	--	NA	NC	NC
1,2,4-Trichlorobenzene	120-82-1	0.004	0.066	0.97	NA	8.46E-08	1.00E-02	1.00E-02	NA	8.46E-06	8.46E-06	NA	1.13E-09	--	--	NA	NC	NC
1,2-Dichloroethane	107-06-2	0.080	0.0042	1	NA	1.01E-07	2.00E-02	2.00E-02	NA	5.05E-06	5.05E-06	NA	1.35E-09	9.10E-02	9.10E-02	NA	1.23E-10	1.23E-10
1,2-Dichloropropane	78-87-5	0.002	0.0078	0.74	NA	5.71E-09	--	--	NA	NC	NC	NA	7.61E-11	6.80E-02	6.80E-02	NA	5.18E-12	5.18E-12
1,3-Dichlorobenzene	541-73-1	0.001	0.058	0.8	NA	1.02E-08	3.00E-02	3.00E-02	NA	3.40E-07	3.40E-07	NA	1.36E-10	--	--	NA	NC	NC
1,4-Dichlorobenzene	106-46-7	0.001	0.042	0.9	NA	1.16E-08	3.00E-02	3.00E-02	NA	3.87E-07	3.87E-07	NA	1.55E-10	2.40E-02	2.40E-02	NA	3.71E-12	3.71E-12
2-Butanone	78-93-3	0.179	0.00096	0.8	NA	5.21E-08	6.00E-01	6.00E-01	NA	8.68E-08	8.68E-08	NA	6.94E-10	--	--	NA	NC	NC
Acetone	67-64-1	1.973	0.000589	0.83	NA	3.39E-07	9.00E-01	9.00E-01	NA	3.77E-07	3.77E-07	NA	4.52E-09	--	--	NA	NC	NC
Benzene	71-43-2	0.915	0.015	0.97	NA	4.15E-06	4.00E-03	4.00E-03	NA	1.04E-03	1.04E-03	NA	5.53E-08	5.50E-02	5.50E-02	NA	3.04E-09	3.04E-09
Carbon disulfide	75-15-0	0.032	0.017	0.63	NA	1.62E-07	1.00E-01	1.00E-01	NA	1.62E-06	1.62E-06	NA	2.16E-09	--	--	NA	NC	NC
Chlorobenzene	108-90-7	0.019	0.028	0.31	NA	1.63E-07	2.00E-02	6.20E-03	NA	2.63E-05	2.63E-05	NA	2.16E-09	--	--	NA	NC	NC
Chloroethane	75-00-3	0.015	0.0061	0.8	NA	2.68E-08	4.00E-01	4.00E-01	NA	6.70E-08	6.70E-08	NA	3.57E-10	2.90E-03	2.90E-03	NA	1.04E-12	1.04E-12
Chloroform	67-66-3	0.011	0.0068	1	NA	2.16E-08	1.00E-02	1.00E-02	NA	2.16E-06	2.16E-06	NA	2.88E-10	--	--	NA	NC	NC
cis-1,2-Dichloroethene	156-59-2	6.950	0.0149	1	NA	3.13E-05	1.00E-02	1.00E-02	NA	3.13E-03	3.13E-03	NA	4.17E-07	--	--	NA	NC	NC
Ethylbenzene	100-41-4	0.328	0.049	0.97	NA	4.86E-06	1.00E-01	1.00E-01	NA	4.86E-05	4.86E-05	NA	6.47E-08	--	--	NA	NC	NC
Methylene chloride	75-09-2	0.040	0.0035	0.95	NA	4.23E-08	6.00E-02	6.00E-02	NA	7.05E-07	7.05E-07	NA	5.64E-10	7.50E-03	7.50E-03	NA	4.23E-12	4.23E-12
Tetrachloroethene	127-18-4	0.008	0.033	1	NA	7.57E-08	1.00E-02	1.00E-02	NA	7.57E-06	7.57E-06	NA	1.01E-09	5.40E-01	5.40E-01	NA	5.45E-10	5.45E-10
Toluene	108-88-3	2.500	0.031	0.8	NA	2.34E-05	2.00E-01	2.00E-01	NA	1.17E-04	1.17E-04	NA	3.12E-07	--	--	NA	NC	NC
trans-1,2-Dichloroethene	156-60-5	0.005	0.0077	1	NA	1.14E-08	2.00E-02	2.00E-02	NA	5.72E-07	5.72E-07	NA	1.52E-10	--	--	NA	NC	NC
Trichloroethene	79-01-6	0.590	0.012	1	NA	2.14E-06	3.00E-04	3.00E-04	NA	7.13E-03	7.13E-03	NA	2.85E-08	4.00E-01	4.00E-01	NA	1.14E-08	1.14E-08
Vinyl chloride	75-01-4a	0.023	0.0056	1	NA	3.87E-08	3.00E-03	3.00E-03	NA	1.29E-05	1.29E-05	NA	5.16E-10	7.20E-01	7.20E-01	NA	3.72E-10	3.72E-10
Xylenes (Total)	1330-20-7	3	0.0704	0.92	NA	6.38E-05	2.00E-01	2.00E-01	NA	3.19E-04	3.19E-04	NA	8.51E-07	--	--	NA	NC	NC
Total PCBs	1336-36-3	0.264	0.922	1	NA	7.36E-05	2.00E-05	2.00E-05	NA	3.68E+00	3.68E+00	NA	9.81E-07	2.00E+00	2.00E+00	NA	1.96E-06	1.96E-06
							Hazard Index:				3.74E+00			Total Cancer Risk:				2.02E-06

Notes:
NC: Risk not calculated. No toxicity value.

Table B-26a
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Ground water AOC-1a: Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	NA
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	NA
SA: Skin Surface Area (cm2)	1980
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	4
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$

ADD-Dermal (mg/kg-day) = $\frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-1a Ground water (mg/L)	Kp (cm/hr)	OA Chronic	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF 1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestio	GW Risk-Dermal	Total GW Risk
Aluminum	7429-90-5	524	0.00214	0.1	NA	3.39E-04	1.00E+00	1.00E-01	NA	3.39E-03	3.39E-03	NA	4.52E-06	--	--	NA	NC	NC
Arsenic	7440-38-2	0.093	0.00193	0.95	NA	5.44E-08	3.00E-04	3.00E-04	NA	1.81E-04	1.81E-04	NA	7.26E-10	1.50E+00	1.50E+00	NA	1.09E-09	1.09E-09
Barium	7440-39-3	0.297	0.000403	0.07	NA	3.61E-08	7.00E-02	4.90E-03	NA	7.37E-06	7.37E-06	NA	4.82E-10	--	--	NA	NC	NC
Beryllium	7440-41-7	0.021	0.00066	0.007	NA	4.16E-09	2.00E-03	1.40E-05	NA	2.97E-04	2.97E-04	NA	5.55E-11	--	--	NA	NC	NC
Chromium	7440-47-3	1.090	0.001	0.013	NA	3.29E-07	1.50E+00	1.95E-02	NA	1.69E-05	1.69E-05	NA	4.39E-09	--	--	NA	NC	NC
Cobalt	7440-48-4	0.139	0.0004	0.8	NA	1.68E-08	2.00E-02	2.00E-02	NA	8.42E-07	8.42E-07	NA	2.25E-10	--	--	NA	NC	NC
Copper	7440-50-8	0.068	0.000307	0.3	NA	6.33E-09	4.00E-02	1.20E-02	NA	5.26E-07	5.26E-07	NA	8.44E-11	--	--	NA	NC	NC
Lead	7439-92-1	0.313	0.0001	0.15	NA	9.46E-09	Request	Request	NA	Request	Request	NA	1.26E-10	Request	Request	NA	Request	Request
Mercury	7439-97-6	0.0002	0.001	0.8	NA	4.54E-11	--	--	NA	NC	NC	NA	6.05E-13	--	--	NA	NC	NC
Nickel	7440-02-0	2.075	0.0002	0.04	NA	1.25E-07	2.00E-02	8.00E-04	NA	1.57E-04	1.57E-04	NA	1.67E-09	--	--	NA	NC	NC
Selenium	7782-49-2	0.052	0.000903	0.8	NA	1.41E-08	5.00E-03	5.00E-03	NA	2.82E-06	2.82E-06	NA	1.88E-10	--	--	NA	NC	NC
Thallium	7440-28-0	0.106	0.000157	1	NA	5.03E-09	7.00E-05	7.00E-05	NA	7.18E-05	7.18E-05	NA	6.70E-11	--	--	NA	NC	NC
Vanadium	7440-62-2	2.700	0.00135	0.026	NA	1.10E-08	1.00E-03	2.60E-05	NA	4.24E-02	4.24E-02	NA	1.47E-08	--	--	NA	NC	NC
Zinc	7440-66-6	1.640	0.0006	0.2	NA	2.97E-07	3.00E-01	6.00E-02	NA	4.96E-06	4.96E-06	NA	3.96E-09	--	--	NA	NC	NC
2,4-Dimethylphenol	105-67-9	0.150	0.011	0.5	NA	4.98E-07	2.00E-02	2.00E-02	NA	2.49E-05	2.49E-05	NA	6.65E-09	--	--	NA	NC	NC
2-Methylnapthalene	91-57-6	0.027	0.142	0.8	NA	1.17E-06	2.00E-02	2.00E-02	NA	5.84E-05	5.84E-05	NA	1.56E-08	--	--	NA	NC	NC
3-Nitroaniline	99-09-2	0.001	0.00257	0.8	NA	1.12E-09	3.00E-04	3.00E-04	NA	3.72E-06	3.72E-06	NA	1.49E-11	2.00E-02	2.00E-02	NA	2.98E-13	2.98E-13
4-Chloro-3-methylphenol	59-50-7	0.001	0.029	0.5	NA	8.76E-09	Request	Request	NA	Request	Request	NA	1.17E-10	Request	Request	NA	Request	Request
4-Chloroaniline	106-47-8	0.292	0.00633	0.5	NA	5.58E-07	4.00E-03	4.00E-03	NA	1.39E-04	1.39E-04	NA	7.44E-09	5.40E-02	5.40E-02	NA	4.02E-10	4.02E-10
4-Methyl-2-pentanone	108-10-1	0.226	0.00397	0.8	NA	2.72E-07	8.00E-02	8.00E-02	NA	3.39E-06	3.39E-06	NA	3.62E-09	--	--	NA	NC	NC
Acenaphthylene	208-96-8	0.002	0.141	0.89	NA	6.96E-08	Request	Request	NA	Request	Request	NA	9.29E-10	Request	Request	NA	Request	Request
Benzo(a)anthracene	56-55-3	0.001	0.47	0.89	NA	1.18E-07	--	--	NA	NC	NC	NA	1.58E-09	7.30E-01	7.30E-01	NA	1.15E-09	1.15E-09
Benzo(a)pyrene	50-32-8	0.001	0.7	0.89	NA	1.76E-07	--	--	NA	NC	NC	NA	2.35E-09	7.30E+00	7.30E+00	NA	1.71E-08	1.71E-08
Benzo(b)fluoranthene	205-99-2	0.001	0.7	0.89	NA	1.52E-07	--	--	NA	NC	NC	NA	2.02E-09	7.30E-01	7.30E-01	NA	1.48E-09	1.48E-09
Benzo(g,h,i)perylene	191-24-2	0.001	2	0.89	NA	4.33E-07	Request	Request	NA	Request	Request	NA	5.78E-09	Request	Request	NA	Request	Request
bis(2-Chloroethyl)ether	111-44-4	1.800	0.0018	0.5	NA	9.79E-07	--	--	NA	NC	NC	NA	1.31E-08	1.10E+00	1.10E+00	NA	1.44E-08	1.44E-08
bis(2-Ethylhexyl)phthalate	117-81-7	0.007	1.97	0.19	NA	4.42E-06	2.00E-02	3.80E-03	NA	1.16E-03	1.16E-03	NA	5.90E-08	1.40E-02	7.40E-02	NA	4.36E-09	4.36E-09
Dibenzofuran	132-64-9	0.001	0.151	0.8	NA	4.10E-08	2.00E-03	2.00E-03	NA	2.05E-05	2.05E-05	NA	5.47E-10	--	--	NA	NC	NC
Indeno(1,2,3-cd)pyrene	193-39-5	0.001	1	0.89	NA	1.76E-07	--	--	NA	NC	NC	NA	2.34E-09	7.30E-01	7.30E-01	NA	1.71E-09	1.71E-09
Isophorone	78-59-1	0.109	0.0034	0.5	NA	1.12E-07	2.00E-01	2.00E-01	NA	5.59E-07	5.59E-07	NA	1.49E-09	9.50E-04	9.50E-04	NA	1.42E-12	1.42E-12
Naphthalene	91-20-3	0.124	0.047	0.89	NA	1.76E-06	2.00E-02	2.00E-02	NA	8.76E-05	8.76E-05	NA	2.34E-08	--	--	NA	NC	NC
Phenanthrene	85-01-8	0.011	0.14	0.89	NA	4.62E-07	Request	Request	NA	Request	Request	NA	6.16E-09	Request	Request	NA	Request	Request
1,1,1-Trichloroethane	71-55-6	0.038	0.013	0.9	NA	1.48E-07	2.80E-01	2.80E-01	NA	5.30E-07	5.30E-07	NA	1.98E-09	--	--	NA	NC	NC
1,1-Dichloroethane	75-34-3	0.094	0.0067	1	NA	1.89E-07	1.00E-01	1.00E-01	NA	1.89E-06	1.89E-06	NA	2.53E-09	--	--	NA	NC	NC
1,2,4-Trichlorobenzene	120-82-1	0.004	0.066	0.97	NA	8.46E-08	1.00E-02	1.00E-02	NA	8.46E-06	8.46E-06	NA	1.13E-09	--	--	NA	NC	NC
1,2-Dichloroethane	107-06-2	0.080	0.0042	1	NA	1.01E-07	2.00E-02	2.00E-02	NA	5.05E-06	5.05E-06	NA	1.35E-09	9.10E-02	9.10E-02	NA	1.23E-10	1.23E-10
1,2-Dichloropropane	78-87-5	0.002	0.0078	0.74	NA	5.71E-09	--	--	NA	NC	NC	NA	7.61E-11	6.80E-02	6.80E-02	NA	5.18E-12	5.18E-12
1,3-Dichlorobenzene	541-73-1	0.001	0.058	0.8	NA	1.02E-08	3.00E-02	3.00E-02	NA	3.40E-07	3.40E-07	NA	1.36E-10	--	--	NA	NC	NC
1,4-Dichlorobenzene	106-46-7	0.001	0.042	0.9	NA	1.16E-08	3.00E-02	3.00E-02	NA	3.87E-07	3.87E-07	NA	1.55E-10	2.40E-02	2.40E-02	NA	3.71E-12	3.71E-12
2-Butanone	78-93-3	0.179	0.00096	0.8	NA	5.21E-08	6.00E-01	6.00E-01	NA	8.68E-08	8.68E-08	NA	6.94E-10	--	--	NA	NC	NC
Acetone	67-64-1	1.973	0.000569	0.83	NA	3.39E-07	9.00E-01	9.00E-01	NA	3.77E-07	3.77E-07	NA	4.52E-09	--	--	NA	NC	NC
Benzene	71-43-2	0.915	0.015	0.97	NA	4.15E-06	4.00E-03	4.00E-03	NA	1.04E-03	1.04E-03	NA	5.53E-08	5.50E-02	5.50E-02	NA	3.04E-09	3.04E-09
Carbon disulfide	75-15-0	0.032	0.017	0.63	NA	1.62E-07	1.00E-01	1.00E-01	NA	1.62E-06	1.62E-06	NA	2.16E-09	--	--	NA	NC	NC
Chlorobenzene	108-90-7	0.019	0.028	0.31	NA	1.63E-07	2.00E-02	6.20E-03	NA	2.63E-05	2.63E-05	NA	2.18E-09	--	--	NA	NC	NC
Chloroethane	75-00-3	0.015	0.0061	0.8	NA	2.68E-08	4.00E-01	4.00E-01	NA	6.70E-08	6.70E-08	NA	3.57E-10	2.90E-03	2.90E-03	NA	1.04E-12	1.04E-12
Chloroform	67-66-3	0.011	0.0068	1	NA	2.16E-08	1.00E-02	1.00E-02	NA	2.16E-06	2.16E-06	NA	2.88E-10	--	--	NA	NC	NC
cis-1,2-Dichloroethene	156-59-2	6.950	0.0149	1	NA	3.13E-05	1.00E-02	1.00E-02	NA	3.13E-03	3.13E-03	NA	4.17E-07	--	--	NA	NC	NC
Ethylbenzene	100-41-4	0.328	0.049	0.97	NA	4.86E-06	1.00E-01	1.00E-01	NA	4.86E-05	4.86E-05	NA	6.47E-08	--	--	NA	NC	NC
Methylene chloride	75-09-2	0.040	0.0035	0.95	NA	4.23E-08	6.00E-02	6.00E-02	NA	7.05E-07	7.05E-07	NA	5.64E-10	7.50E-03	7.50E-03	NA	4.23E-12	4.23E-12
Tetrachloroethene	127-18-4	0.008	0.033	1	NA	7.57E-08	1.00E-02	1.00E-02	NA	7.57E-06	7.57E-06	NA	1.01E-09	5.40E-01	5.40E-01	NA	5.45E-10	5.45E-10
Toluene	108-88-3	2.500	0.031	0.8	NA	2.34E-05	2.00E-01	2.00E-01	NA	1.17E-04	1.17E-04	NA	3.12E-07	--	--	NA	NC	NC
trans-1,2-Dichloroethene	156-60-5	0.005	0.0077	1	NA	1.14E-08	2.00E-02	2.00E-02	NA	5.72E-07	5.72E-07	NA	1.52E-10	--	--	NA	NC	NC
Trichloroethene	79-01-6	0.590	0.012	1	NA	2.14E-06	3.00E-04	3.00E-04	NA	7.13E-03	7.13E-03	NA	2.85E-08	4.00E-01	4.00E-01	NA	1.14E-08	1.14E-08
Vinyl chloride	75-01-4a	0.023	0.0056	1	NA	3.87E-08	3.00E-03	3.00E-03	NA	1.29E-05	1.29E-05	NA	5.16E-10	7.20E-01	7.20E-01	NA	3.72E-10	3.72E-10
Xylenes (Total)	1330-20-7	3	0.0704	0.92	NA	6.38E-05	2.00E-01	2.00E-01	NA	3.19E-04	3.19E-04	NA	8.51E-07	--	--	NA	NC	NC
Total PCBs	1336-36-3	0.264	0.922	1	NA	7.36E-05	2.00E-05	2.00E-05	NA	3.68E+00	3.68E+00	NA	9.81E-07	2.00E+00	2.00E+00	NA	1.96E-06	1.96E-06
							Hazard Index:				3.74E+00			Total Cancer Risk:				2.02E-06

Notes:
NC: Risk not calculated. No toxicity value.

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Table B-26b
Calculation of Potential Risks and Hazard Indices
Construction Worker (CTE)
Ground water AOC-1a: Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	NA
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	NA
SA: Skin Surface Area (cm2)	90-I
Kp - Permeability Constant (cm/hr)	Chemical-Specific
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	4
ED: Exposure Duration (years)	0.5
BW: Body Weight (kg)	71.8
AT: Averaging Time (days)(75 yr. x 365 days/yr, canc	27375
AT: Averaging Time (days)(ED x 365 days/yr, noncan	182.5
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$

ADD-Dermal (mg/kg-day) = $\frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-1a Ground water (mg/L)	Kp (cm/hr)	OA Chronic	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-	ADD Dermal (mg/kg-day)	CSF 1/(mg/kg-day)	CSF- adjusted 1/(mg/kg-day)	GW Risk- Ingestio	GW Risk- Dermal	Total GW Risk
Aluminum	7429-90-5	524	0.00214	0.1	NA	1.55E-04	1.00E+00	1.00E-01	NA	1.55E-03	1.55E-03	NA	1.03E-06	--	--	NA	NC	NC
Arsenic	7440-38-2	0.093	0.00193	0.95	NA	2.48E-08	3.00E-04	3.00E-04	NA	8.28E-05	8.28E-05	NA	1.66E-10	1.50E+00	1.50E+00	NA	2.48E-10	2.48E-10
Barium	7440-39-3	0.297	0.000403	0.07	NA	1.65E-08	7.00E-02	4.90E-03	NA	3.37E-06	3.37E-06	NA	1.10E-10	--	--	NA	NC	NC
Beryllium	7440-41-7	0.021	0.00066	0.007	NA	1.90E-09	2.00E-03	1.40E-05	NA	1.36E-04	1.36E-04	NA	1.27E-11	--	--	NA	NC	NC
Chromium	7440-47-3	1.090	0.001	0.013	NA	1.50E-07	1.50E+00	1.95E-02	NA	7.71E-06	7.71E-06	NA	1.00E-09	--	--	NA	NC	NC
Cobalt	7440-48-4	0.139	0.0004	0.8	NA	7.69E-09	2.00E-02	2.00E-02	NA	3.85E-07	3.85E-07	NA	5.13E-11	--	--	NA	NC	NC
Copper	7440-50-8	0.068	0.000307	0.3	NA	2.89E-09	4.00E-02	1.20E-02	NA	2.41E-07	2.41E-07	NA	1.93E-11	--	--	NA	NC	NC
Lead	7439-92-1	0.313	0.0001	0.15	NA	4.32E-09	Request	Request	NA	Request	Request	NA	2.88E-11	Request	Request	NA	Request	Request
Mercury	7439-97-6	0.0002	0.001	0.8	NA	2.07E-11	--	--	NA	NC	NC	NA	1.38E-13	--	--	NA	NC	NC
Nickel	7440-02-0	2.075	0.0002	0.04	NA	5.73E-08	2.00E-02	8.00E-04	NA	7.16E-05	7.16E-05	NA	3.82E-10	--	--	NA	NC	NC
Selenium	7782-49-2	0.052	0.000903	0.8	NA	6.45E-09	5.00E-03	5.00E-03	NA	1.29E-06	1.29E-06	NA	4.30E-11	--	--	NA	NC	NC
Thallium	7440-28-0	0.106	0.000157	1	NA	2.29E-09	7.00E-05	7.00E-05	NA	3.28E-05	3.28E-05	NA	1.53E-11	--	--	NA	NC	NC
Vanadium	7440-62-2	2.700	0.00135	0.026	NA	5.03E-07	1.00E-03	2.60E-05	NA	1.93E-02	1.93E-02	NA	3.35E-09	--	--	NA	NC	NC
Zinc	7440-66-6	1.640	0.0006	0.2	NA	1.36E-07	3.00E-01	6.00E-02	NA	2.26E-06	2.26E-06	NA	9.05E-10	--	--	NA	NC	NC
2,4-Dimethylphenol	105-67-9	0.150	0.011	0.5	NA	2.28E-07	2.00E-02	2.00E-02	NA	1.14E-05	1.14E-05	NA	1.52E-09	--	--	NA	NC	NC
2-Methylnapthalene	91-57-6	0.027	0.142	0.8	NA	5.33E-07	2.00E-02	2.00E-02	NA	2.67E-05	2.67E-05	NA	3.56E-09	--	--	NA	NC	NC
3-Nitroaniline	99-09-2	0.001	0.00257	0.8	NA	5.10E-10	3.00E-04	3.00E-04	NA	1.70E-06	1.70E-06	NA	3.40E-12	2.00E-02	2.00E-02	NA	6.80E-14	6.80E-14
4-Chloro-3-methylphenol	59-50-7	0.001	0.029	0.5	NA	4.00E-09	Request	Request	NA	Request	Request	NA	2.67E-11	Request	Request	NA	Request	Request
4-Chloroaniline	106-47-8	0.292	0.00833	0.5	NA	2.55E-07	4.00E-03	4.00E-03	NA	6.37E-05	6.37E-05	NA	1.70E-09	5.40E-02	5.40E-02	NA	9.17E-11	9.17E-11
4-Methyl-2-pentanone	108-10-1	0.226	0.00397	0.8	NA	1.24E-07	8.00E-02	8.00E-02	NA	1.55E-06	1.55E-06	NA	8.27E-10	--	--	NA	NC	NC
Acenaphthylene	208-96-8	0.002	0.141	0.89	NA	3.18E-08	Request	Request	NA	Request	Request	NA	2.12E-10	Request	Request	NA	Request	Request
Benzo(a)anthracene	56-55-3	0.001	0.47	0.89	NA	5.39E-08	--	--	NA	NC	NC	NA	3.60E-10	7.30E-01	7.30E-01	NA	2.63E-10	2.63E-10
Benzo(a)pyrene	50-32-8	0.001	0.7	0.89	NA	8.03E-08	--	--	NA	NC	NC	NA	5.36E-10	7.30E+00	7.30E+00	NA	3.91E-09	3.91E-09
Benzo(b)fluoranthene	205-99-2	0.001	0.7	0.89	NA	6.92E-08	--	--	NA	NC	NC	NA	4.62E-10	7.30E-01	7.30E-01	NA	3.37E-10	3.37E-10
Benzo(g,h,i)perylene	191-24-2	0.001	2	0.89	NA	1.98E-07	Request	Request	NA	Request	Request	NA	1.32E-09	Request	Request	NA	Request	Request
bis(2-Chloroethyl)ether	111-44-4	1.800	0.0018	0.5	NA	4.47E-07	--	--	NA	NC	NC	NA	2.98E-09	1.10E+00	1.10E+00	NA	3.28E-09	3.28E-09
bis(2-Ethylhexyl)phthalate	117-81-7	0.007	1.97	0.19	NA	2.02E-06	2.00E-02	3.80E-03	NA	5.31E-04	5.31E-04	NA	1.35E-08	1.40E-02	7.40E-02	NA	9.96E-10	9.96E-10
Dibenzofuran	132-64-9	0.001	0.151	0.8	NA	1.87E-08	2.00E-03	2.00E-03	NA	9.36E-06	9.36E-06	NA	1.25E-10	--	--	NA	NC	NC
Indeno(1,2,3-cd)pyrene	193-39-5	0.001	1	0.89	NA	8.02E-08	--	--	NA	NC	NC	NA	5.35E-10	7.30E-01	7.30E-01	NA	3.90E-10	3.90E-10
Isophorone	78-59-1	0.109	0.0034	0.5	NA	5.10E-08	2.00E-01	2.00E-01	NA	2.55E-07	2.55E-07	NA	3.40E-10	9.50E-04	9.50E-04	NA	3.23E-13	3.23E-13
Naphthalene	91-20-3	0.124	0.047	0.89	NA	8.02E-07	2.00E-02	2.00E-02	NA	4.01E-05	4.01E-05	NA	5.35E-09	--	--	NA	NC	NC
Phenanthrene	85-01-8	0.011	0.14	0.89	NA	2.11E-07	Request	Request	NA	Request	Request	NA	1.41E-09	Request	Request	NA	Request	Request
1,1,1-Trichloroethane	71-55-6	0.038	0.013	0.9	NA	6.77E-08	2.80E-01	2.80E-01	NA	2.42E-07	2.42E-07	NA	4.51E-10	--	--	NA	NC	NC
1,1-Dichloroethane	75-34-3	0.094	0.0067	1	NA	8.65E-08	1.00E-01	1.00E-01	NA	8.65E-07	8.65E-07	NA	5.77E-10	--	--	NA	NC	NC
1,2,4-Trichlorobenzene	120-82-1	0.004	0.066	0.97	NA	3.86E-08	1.00E-02	1.00E-02	NA	3.86E-06	3.86E-06	NA	2.57E-10	--	--	NA	NC	NC
1,2-Dichloroethane	107-06-2	0.080	0.0042	1	NA	4.61E-08	2.00E-02	2.00E-02	NA	2.31E-06	2.31E-06	NA	3.08E-10	9.10E-02	9.10E-02	NA	2.80E-11	2.80E-11
1,2-Dichloropropane	78-87-5	0.002	0.0078	0.74	NA	2.61E-09	--	--	NA	NC	NC	NA	1.74E-11	6.80E-02	6.80E-02	NA	1.18E-12	1.18E-12
1,3-Dichlorobenzene	541-73-1	0.001	0.058	0.8	NA	4.65E-09	3.00E-02	3.00E-02	NA	1.55E-07	1.55E-07	NA	3.10E-11	--	--	NA	NC	NC
1,4-Dichlorobenzene	106-46-7	0.001	0.042	0.9	NA	5.30E-09	3.00E-02	3.00E-02	NA	1.77E-07	1.77E-07	NA	3.53E-11	2.40E-02	2.40E-02	NA	8.47E-13	8.47E-13
2-Butanone	78-93-3	0.179	0.00096	0.8	NA	2.38E-08	6.00E-01	6.00E-01	NA	3.96E-08	3.96E-08	NA	1.58E-10	--	--	NA	NC	NC
Acetone	67-64-1	1.973	0.000569	0.83	NA	1.55E-07	9.00E-01	9.00E-01	NA	1.72E-07	1.72E-07	NA	1.03E-09	--	--	NA	NC	NC
Benzene	71-43-2	0.915	0.015	0.97	NA	1.89E-06	4.00E-03	4.00E-03	NA	4.73E-04	4.73E-04	NA	1.26E-08	5.50E-02	5.50E-02	NA	6.94E-10	6.94E-10
Carbon disulfide	75-15-0	0.032	0.017	0.63	NA	7.39E-08	1.00E-01	1.00E-01	NA	7.39E-07	7.39E-07	NA	4.93E-10	--	--	NA	NC	NC
Chlorobenzene	108-90-7	0.019	0.028	0.31	NA	7.46E-08	2.00E-02	6.20E-03	NA	1.20E-05	1.20E-05	NA	4.97E-10	--	--	NA	NC	NC
Chloroethane	75-00-3	0.015	0.0061	0.8	NA	1.22E-08	4.00E-01	4.00E-01	NA	3.06E-08	3.06E-08	NA	8.15E-11	2.90E-03	2.90E-03	NA	2.36E-13	2.36E-13
Chloroform	67-66-3	0.011	0.0068	1	NA	9.86E-09	1.00E-02	1.00E-02	NA	9.86E-07	9.86E-07	NA	6.58E-11	--	--	NA	NC	NC
cis-1,2-Dichloroethene	156-59-2	6.950	0.0149	1	NA	1.43E-05	1.00E-02	1.00E-02	NA	1.43E-03	1.43E-03	NA	9.53E-08	--	--	NA	NC	NC
Ethylbenzene	100-41-4	0.328	0.049	0.97	NA	2.22E-06	1.00E-01	1.00E-01	NA	2.22E-05	2.22E-05	NA	1.48E-08	--	--	NA	NC	NC
Methylene chloride	75-09-2	0.040	0.0035	0.95	NA	1.93E-08	6.00E-02	6.00E-02	NA	3.22E-07	3.22E-07	NA	1.29E-10	7.50E-03	7.50E-03	NA	9.66E-13	9.66E-13
Tetrachloroethene	127-18-4	0.008	0.033	1	NA	3.45E-08	1.00E-02	1.00E-02	NA	3.45E-06	3.45E-06	NA	2.30E-10	5.40E-01	5.40E-01	NA	1.24E-10	1.24E-10
Toluene	108-88-3	2.500	0.031	0.8	NA	1.07E-05	2.00E-01	2.00E-01	NA	5.35E-05	5.35E-05	NA	7.13E-08	--	--	NA	NC	NC
trans-1,2-Dichloroethene	156-60-5	0.005	0.0077	1	NA	5.22E-09	2.00E-02	2.00E-02	NA	2.61E-07	2.61E-07	NA	3.48E-11	--	--	NA	NC	NC
Trichloroethene	79-01-6	0.590	0.012	1	NA	9.77E-07	3.00E-04	3.00E-04	NA	3.26E-03	3.26E-03	NA	6.51E-09	4.00E-01	4.00E-01	NA	2.61E-09	2.61E-09
Vinyl chloride	75-01-4a	0.023	0.0056	1	NA	1.77E-08	3.00E-03	3.00E-03	NA	5.89E-06	5.89E-06	NA	1.18E-10	7.20E-01	7.20E-01	NA	8.48E-11	8.48E-11
Xylenes (Total)	1330-20-7	3	0.0704	0.92	NA	2.91E-05	2.00E-01	2.00E-01	NA	1.46E-04	1.46E-04	NA	1.94E-07	--	--	NA	NC	NC
Total PCBs	1336-36-3	0.264	0.922	1	NA	3.36E-05	2.00E-05	2.00E-05	NA	1.68E+00	1.68E+00	NA	2.24E-07	2.00E+00	2.00E+00	NA	4.48E-07	4.48E-07
							Hazard Index:				1.71E+00				Total Cancer Risk:			4.61E-07

Notes:
NC: Risk not calculated. No toxicity value.

Table B-27
Calculation of Potential Risks and Hazard Indices
Construction Worker (RME)
Ground water AOC-1c: Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	NA
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	NA
SA: Skin Surface Area (cm2)	1980
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	4
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$

ADD-Dermal (mg/kg-day) = $\frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-1c Ground water (mg/L)	Kp (cm/hr)	OA Chronic	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Arsenic	7440-38-2	0.0091	1.93E-03	0.95	NA	5.31E-09	3.00E-04	3.00E-04	NA	1.77E-05	1.77E-05	NA	7.08E-11	1.50E+00	1.50E+00	NA	1.06E-10	1.06E-10
							Hazard Index:				1.77E-05			Total Cancer Risk:				1.06E-10

Notes:
NC: Risk not calculated. No toxicity value.

Table B-28
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-6 ft. AOC-1: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times RAF \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-1 Subsurface Soil 0-6 ft. (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF- adjusted [1/(mg/kg-day)]	Soil Risk- Ingestion	Soil Risk- Dermal	Total Soil Risk
Aluminum	7429-90-5	12200	0.1	0.001	2.33E-05	5.41E-06	1.00E+00	1.00E-01	2.33E-05	5.41E-05	7.74E-05	3.10E-07	7.22E-08	--	--	NC	NC	NC
Arsenic	7440-38-2	20	0.95	0.03	3.62E-07	2.66E-07	3.00E-04	3.00E-04	1.21E-03	8.87E-04	2.10E-03	4.83E-09	3.55E-09	1.50E+00	1.50E+00	7.25E-09	5.32E-09	1.26E-08
Chromium	7440-47-3	140	0.013	0.001	3.47E-08	6.21E-08	1.50E+00	1.95E-02	2.31E-08	3.19E-06	3.21E-06	4.63E-10	8.28E-10	--	--	NC	NC	NC
Iron	7439-89-6	29100	0.15	0.001	8.33E-05	1.29E-05	3.00E-01	4.50E-02	2.78E-04	2.87E-04	5.65E-04	1.11E-06	1.72E-07	--	--	NC	NC	NC
Lead	7439-92-1	537	0.15	0.001	1.54E-06	2.38E-07	Request	Request	Request	Request	Request	2.05E-08	3.18E-09	Request	Request	Request	Request	Request
Acenaphthylene	208-96-8	0.4	0.89	0.13	6.79E-09	2.31E-08	Request	Request	Request	Request	Request	9.06E-11	3.08E-10	Request	Request	Request	Request	Request
Benzo(g,h,i)perylene	191-24-2	0.046	0.89	0.13	7.81E-10	2.65E-09	Request	Request	Request	Request	Request	1.04E-11	3.54E-11	Request	Request	Request	Request	Request
Naphthalene	91-20-3	19	0.89	0.13	3.23E-07	1.10E-06	2.00E-02	2.00E-02	1.61E-05	5.48E-05	7.09E-05	4.30E-09	1.46E-08	--	--	NC	NC	NC
Phenanthrene	85-01-8	7.2	0.89	0.13	1.22E-07	4.15E-07	Request	Request	Request	Request	Request	1.63E-09	5.54E-09	Request	Request	Request	Request	Request
Total PCBs	1336-36-3	11.06	1	0.14	2.11E-07	6.87E-07	2.00E-05	2.00E-05	1.06E-02	3.44E-02	4.49E-02	2.81E-09	9.16E-09	2.00E+00	2.00E+00	5.63E-09	1.83E-08	2.39E-08
							Hazard Index:				4.77E-02				Total Cancer Risk:			3.65E-08

Notes:
NC: Risk not calculated. No toxicity value.

Table B-29
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Surface Soil 0-6 in. AOC-1: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)*	0.5
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncanc	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{\text{CS x IR x FRx OA x EF x ED x CF}}{\text{BW x AT}}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{\text{CS x DAFx SA x RAF x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-1 Surface Soil 0-6 in. (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF- adjusted [1/(mg/kg-day)]	Soil Risk- Ingestion	Soil Risk- Dermal	Total Soil Risk
Aluminum	7429-90-5	10300	0.1	0.001	1.97E-05	4.57E-06	1.00E+00	1.00E-01	1.97E-05	4.57E-05	6.54E-05	2.62E-07	6.09E-08	--	--	NC	NC	NC
Arsenic	7440-38-2	7.70	0.95	0.03	1.40E-07	1.02E-07	3.00E-04	3.00E-04	4.65E-04	3.42E-04	8.07E-04	1.86E-09	1.37E-09	1.50E+00	1.50E+00	2.79E-09	2.05E-09	4.84E-09
Chromium	7440-47-3	31.5	0.013	0.001	7.81E-09	1.40E-08	1.50E+00	1.95E-02	5.21E-09	7.17E-07	7.22E-07	1.04E-10	1.86E-10	--	--	NC	NC	NC
Iron	7439-89-6	20800	0.15	0.001	5.95E-05	9.23E-06	3.00E-01	4.50E-02	1.98E-04	2.05E-04	4.04E-04	7.94E-07	1.23E-07	--	--	NC	NC	NC
Benzo(g,h,i)perylene	191-24-2	0.046	0.89	0.13	7.81E-10	2.65E-09	Request	Request	Request	Request	Request	1.04E-11	3.54E-11	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.051	0.89	0.13	8.66E-10	2.94E-09	Request	Request	Request	Request	Request	1.15E-11	3.92E-11	Request	Request	Request	Request	Request
							Hazard Index:				1.28E-03			Total Cancer Risk:				4.84E-09

Notes:
NC: Risk not calculated. No toxicity value.

800361

Table B-30
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Surface Soil 0-6 in. AOC-2: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{\text{CS x IR x FRx OA x EF x ED x CF}}{\text{BW x AT}}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{\text{CS x DAFx SA x RAF x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-2 Surface Soil 0-6 in. (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF- adjusted [1/(mg/kg-day)]	Soil Risk- Ingestion	Soil Risk- Dermal	Total Soil Risk
Arsenic	7440-38-2	5.70	0.95	0.03	1.03E-07	7.59E-08	3.00E-04	3.00E-04	3.44E-04	2.53E-04	5.97E-04	1.38E-09	1.01E-09	1.50E+00	1.50E+00	2.07E-09	1.52E-09	3.58E-09
Iron	7439-89-6	13400	0.15	0.001	3.83E-05	5.95E-06	3.00E-01	4.50E-02	1.28E-04	1.32E-04	2.60E-04	5.11E-07	7.93E-08	--	--	NC	NC	NC
Benzo(a)pyrene	50-32-8	0.34	0.89	0.13	5.77E-09	1.96E-08	--	--	NC	NC	NC	7.70E-11	2.61E-10	7.30E+00	7.30E+00	5.62E-10	1.91E-09	2.47E-09
Benzo(g,h,i)perylene	191-24-2	0.18	0.89	0.13	3.06E-09	1.04E-08	Request	Request	Request	Request	Request	4.08E-11	1.38E-10	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.33	0.89	0.13	5.60E-09	1.90E-08	Request	Request	Request	Request	Request	7.47E-11	2.54E-10	Request	Request	Request	Request	Request
Total PCBs	1336-36-3	0.45	1	0.14	8.59E-09	2.80E-08	2.00E-05	2.00E-05	4.29E-04	1.40E-03	1.83E-03	1.14E-10	3.73E-10	2.00E+00	2.00E+00	2.29E-10	7.45E-10	9.74E-10
							Hazard Index:				2.68E-03			Total Cancer Risk:				7.03E-09

Notes:
NC: Risk not calculated. No toxicity value.

Table B-31
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-6 ft. AOC-2: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncanc	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times RAF \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-2 Subsurface Soil 0-6 ft. (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF- adjusted [1/(mg/kg-day)]	Soil Risk- Ingestion	Soil Risk- Dermal	Total Soil Risk
Arsenic	7440-38-2	5.70	0.95	0.03	1.03E-07	7.59E-08	3.00E-04	3.00E-04	3.44E-04	2.53E-04	5.97E-04	1.38E-09	1.01E-09	1.50E+00	1.50E+00	2.07E-09	1.52E-09	3.58E-09
Iron	7439-89-6	13400	0.15	0.001	3.83E-05	5.95E-06	3.00E-01	4.50E-02	1.28E-04	1.32E-04	2.60E-04	5.11E-07	7.93E-08	--	--	NC	NC	NC
Lead	7439-92-1	244	0.15	0.001	6.98E-07	1.08E-07	Request	Request	Request	Request	Request	9.31E-09	1.44E-09	Request	Request	Request	Request	Request
Acenaphthylene	208-96-8	0.23	0.89	0.13	3.91E-09	1.33E-08	Request	Request	Request	Request	Request	5.21E-11	1.77E-10	Request	Request	Request	Request	Request
Benzo(a)pyrene	50-32-8	0.34	0.89	0.13	5.77E-09	1.96E-08	--	--	NC	NC	NC	7.70E-11	2.61E-10	7.30E+00	7.30E+00	5.62E-10	1.91E-09	2.47E-09
Benzo(g,h,i)perylene	191-24-2	0.18	0.89	0.13	3.06E-09	1.04E-08	Request	Request	Request	Request	Request	4.08E-11	1.38E-10	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	4.1	0.89	0.13	6.96E-08	2.36E-07	Request	Request	Request	Request	Request	9.28E-10	3.15E-09	Request	Request	Request	Request	Request
Total PCBs	1336-36-3	3.01	1	0.14	5.74E-08	1.87E-07	2.00E-05	2.00E-05	2.87E-03	9.35E-03	1.22E-02	7.66E-10	2.49E-09	2.00E+00	2.00E+00	1.53E-09	4.99E-09	6.52E-09
							Hazard Index:				1.31E-02					Total Cancer Risk:		1.26E-08

Notes:
NC: Risk not calculated. No toxicity value.

800363

Table B-32
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-6 ft. AOC-3: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.5
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times RAF \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-3 Subsurface Soil 0-6 ft. (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF- adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Arsenic	7440-38-2	3	0.95	0.03	5.44E-08	3.99E-08	3.00E-04	3.00E-04	1.81E-04	1.33E-04	3.14E-04	7.25E-10	5.32E-10	1.50E+00	1.50E+00	1.09E-09	7.99E-10	1.89E-09
Benzo(g,h,i)perylene	191-24-2	0.058	0.89	0.13	9.85E-10	3.35E-09	Request	Request	Request	Request	Request	1.31E-11	4.46E-11	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.43	0.89	0.13	7.30E-09	2.48E-08	Request	Request	Request	Request	Request	9.74E-11	3.31E-10	Request	Request	Request	Request	Request
							Hazard Index:				3.14E-04			Total Cancer Risk:				1.89E-09

Notes:
NC: Risk not calculated. No toxicity value.

Table B-33
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-6 ft. AOC-4: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times RAF \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-4 Subsurface Soil 0-6 ft. (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Arsenic	7440-38-2	1.80	0.95	0.03	3.26E-08	2.40E-08	3.00E-04	3.00E-04	1.09E-04	7.99E-05	1.89E-04	4.35E-10	3.19E-10	1.50E+00	1.50E+00	6.52E-10	4.79E-10	1.13E-09
							Hazard Index:				1.89E-04			Total Cancer Risk:				1.13E-09

Notes:
NC: Risk not calculated. No toxicity value.

800365

Table B-34
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-6 ft. AOC-5: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times RAF \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-5 Subsurface Soil 0-6 ft. (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-adjusted (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Arsenic	7440-38-2	2.40	0.95	0.03	4.35E-08	3.19E-08	3.00E-04	3.00E-04	1.45E-04	1.06E-04	2.51E-04	5.80E-10	4.26E-10	1.50E+00	1.50E+00	8.70E-10	6.39E-10	1.51E-09
							Hazard Index:				2.51E-04			Total Cancer Risk:				1.51E-09

Notes:
NC: Risk not calculated. No toxicity value.

Table B-35
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-7 ft. AOC-6: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
DA: Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{\text{CS x IR x FRx OA x EF x ED x CF}}{\text{BW x AT}}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{\text{CS x DAFx SA x DA x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-6 Subsurface Soil 0-7 ft. (mg/kg)	OA	DA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Arsenic	7440-38-2	1.2	0.95	0.03	2.17E-08	1.60E-08	3.00E-04	3.00E-04	7.25E-05	5.32E-05	1.26E-04	2.90E-10	2.13E-10	1.50E+00	1.50E+00	4.35E-10	3.19E-10	7.54E-10
Benzo(a)pyrene	50-32-8	0.25	0.89	0.13	4.25E-09	1.44E-08	--	--	NC	NC	NC	5.66E-11	1.92E-10	7.30E+00	7.30E+00	4.13E-10	1.40E-09	1.82E-09
Benzo(g,h,i)perylene	191-24-2	0.082	0.89	0.13	1.39E-09	4.73E-09	Request	Request	Request	Request	Request	1.86E-11	6.31E-11	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	6.5	0.89	0.13	1.10E-07	3.75E-07	Request	Request	Request	Request	Request	1.47E-09	5.00E-09	Request	Request	Request	Request	Request
Ethylbenzene	100-41-4	25	0.97	NA	4.63E-07	NA	1.00E-01	1.00E-01	4.63E-06	NA	4.63E-06	6.17E-09	NA	--	--	NC	NC	NC
Xylenes (Total)	1330-20-7	73	0.92	NA	1.28E-06	NA	2.00E-01	2.00E-01	6.41E-06	NA	6.41E-06	1.71E-08	NA	--	--	NC	NC	NC
Total PCBs	1336-36-3	16	1	0.14	3.05E-07	9.94E-07	2.00E-05	2.00E-05	1.53E-02	4.97E-02	6.50E-02	4.07E-09	1.33E-08	2.00E+00	2.00E+00	8.14E-09	2.65E-08	3.46E-08
							Hazard Index:				6.51E-02				Total Cancer Risk:			3.72E-08

Notes:
NC: Risk not calculated. No toxicity value.
NA : Not applicable. No dermal absorption values are presented for volatile compounds. EPA (2001) does not consider dermal exposure to volatile organic compounds present in soil to be significant. The compounds tend to volatilize from soil and should be accounted for via the inhalation pathway.

800367

Table B-36
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-6 ft. AOC-BP: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{\text{CS x IR x FRx OA x EF x ED x CF}}{\text{BW x AT}}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{\text{CS x DAFx SA x RAF x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-BP Subsurface Soil 0-6 ft. (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Dermal (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Aluminum	7429-90-5	8442.08	0.1	0.001	1.61E-05	3.75E-06	1.00E+00	1.00E-01	1.61E-05	3.75E-05	5.36E-05	2.15E-07	4.99E-08	--	--	NC	NC	NC
Arsenic	7440-38-2	66.76	0.95	0.03	1.21E-06	8.89E-07	3.00E-04	3.00E-04	4.03E-03	2.96E-03	7.00E-03	1.61E-08	1.18E-08	1.50E+00	1.50E+00	2.42E-08	1.78E-08	4.20E-08
Chromium	7440-47-3	66.76	0.013	0.001	1.66E-08	2.96E-08	1.50E+00	1.95E-02	1.10E-08	1.52E-06	1.53E-06	2.21E-10	3.95E-10	--	--	NC	NC	NC
Iron	7439-89-6	25600	0.15	0.001	7.33E-05	1.14E-05	3.00E-01	4.50E-02	2.44E-04	2.52E-04	4.97E-04	9.77E-07	1.51E-07	--	--	NC	NC	NC
Lead	7439-92-1	83.98	0.15	0.001	2.40E-07	3.73E-08	Request	Request	Request	Request	Request	3.20E-09	4.97E-10	Request	Request	Request	Request	Request
Acenaphthylene	208-96-8	0.06	0.89	0.13	1.08E-09	3.65E-09	Request	Request	Request	Request	Request	1.43E-11	4.87E-11	Request	Request	Request	Request	Request
Benzo(a)pyrene	50-32-8	0.13	0.89	0.13	2.23E-09	7.59E-09	--	--	NC	NC	NC	2.98E-11	1.01E-10	7.30E+00	7.30E+00	2.17E-10	7.39E-10	9.56E-10
Benzo(g,h,i)perylene	191-24-2	0.09	0.89	0.13	1.46E-09	4.95E-09	Request	Request	Request	Request	Request	1.94E-11	6.60E-11	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.44	0.89	0.13	7.45E-09	2.53E-08	Request	Request	Request	Request	Request	9.94E-11	3.38E-10	Request	Request	Request	Request	Request
Total PCBs	1336-36-3	9.80	1	0.14	1.87E-07	6.09E-07	2.00E-05	2.00E-05	9.35E-03	3.04E-02	3.98E-02	2.49E-09	8.12E-09	2.00E+00	2.00E+00	4.99E-09	1.62E-08	2.12E-08
							Hazard Index:				4.73E-02				Total Cancer Risk:			6.42E-08

Notes:
NC: Risk not calculated. No toxicity value.

Table B-37
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Surface Soil 0-6 in. AOC-BP: Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	2584
DAF: Dermal Adherence Factor (mg/cm2)	0.9
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	365
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{\text{CS x IR x FRx OA x EF x ED x CF}}{\text{BW x AT}}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{\text{CS x DAFx SA x RAF x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-BP Surface Soil 0-6 in. (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-adjusted (mg/kg-day)	Soil HQ Ingestion	Soil HQ Dermal	Total Soil HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Soil Risk-Ingestion	Soil Risk-Dermal	Total Soil Risk
Aluminum	7429-90-5	13700	0.1	0.001	2.61E-05	6.08E-06	1.00E+00	1.00E-01	2.61E-05	6.08E-05	8.69E-05	3.49E-07	8.10E-08	--	--	NC	NC	NC
Arsenic	7440-38-2	9.10	0.95	0.03	1.65E-07	1.21E-07	3.00E-04	3.00E-04	5.50E-04	4.04E-04	9.54E-04	2.20E-09	1.62E-09	1.50E+00	1.50E+00	3.30E-09	2.42E-09	5.72E-09
Chromium	7440-47-3	42.10	0.013	0.001	1.04E-08	1.87E-08	1.50E+00	1.95E-02	6.96E-09	9.58E-07	9.65E-07	1.39E-10	2.49E-10	--	--	NC	NC	NC
Iron	7439-89-6	25600	0.15	0.001	7.33E-05	1.14E-05	3.00E-01	4.50E-02	2.44E-04	2.52E-04	4.97E-04	9.77E-07	1.51E-07	--	--	NC	NC	NC
Benzo(g,h,i)perylene	191-24-2	0.041	0.89	0.13	6.96E-10	2.36E-09	Request	Request	Request	Request	Request	9.28E-12	3.15E-11	Request	Request	Request	Request	Request
Phenanthrene	85-01-8	0.083	0.89	0.13	1.41E-09	4.79E-09	Request	Request	Request	Request	Request	1.88E-11	6.38E-11	Request	Request	Request	Request	Request
							Hazard Index:				1.54E-03			Total Cancer Risk:				5.72E-09

Notes:
NC: Risk not calculated. No toxicity value.

800369

Table B-38
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-6 ft. AOC-1: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	66
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-1 Subsurface Soil 0-6 ft. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Aluminum	7429-90-5	12200	1.84E-06	1.00E-03	1.84E-03	2.46E-08	--	NC
Arsenic	7440-38-2	20	3.02E-09	3.00E-04	1.01E-05	4.03E-11	1.51E+01	6.08E-10
Chromium	7440-47-3	140	2.12E-08	1.50E+00	1.41E-08	2.82E-10	--	NC
Iron	7439-89-6	29100	4.40E-06	3.00E-01	1.47E-05	5.86E-08	--	NC
Lead	7439-92-1	537	8.11E-08	Request	Request	1.08E-09	Request	Request
Acenaphthylene	208-96-8	0.4	6.04E-11	Request	Request	8.06E-13	Request	Request
Benzo(g,h,i)perylene	191-24-2	0.046	6.95E-12	Request	Request	9.27E-14	Request	Request
Naphthalene	91-20-3	19	2.87E-09	9.00E-04	3.19E-06	3.83E-11	--	NC
Phenanthrene	85-01-8	7.2	1.09E-09	Request	Request	1.45E-11	Request	Request
Total PCBs	1336-36-3	11.06	1.67E-09	2.00E-05	8.36E-05	2.23E-11	2.00E+00	4.46E-11
			Hazard Index:		1.95E-03	Total Cancer Risk:		6.53E-10

Notes:
NC: Risk not calculated. No toxicity value.

Table B-39
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-6 ft. AOC-2: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	66
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-2 Subsurface Soil 0-6 ft. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Arsenic	7440-38-2	5.70	8.61E-10	3.00E-04	2.87E-06	1.15E-11	1.51E+01	1.73E-10
Iron	7439-89-6	13400	2.02E-06	3.00E-01	6.75E-06	2.70E-08	--	NC
Lead	7439-92-1	244	3.69E-08	Request	Request	4.92E-10	Request	Request
Acenaphthylene	208-96-8	0.23	3.48E-11	Request	Request	4.63E-13	Request	Request
Benzo(a)pyrene	50-32-8	0.34	5.14E-11	--	NC	6.85E-13	3.10E+00	2.12E-12
Benzo(g,h,i)perylene	191-24-2	0.18	2.72E-11	Request	Request	3.63E-13	Request	Request
Phenanthrene	85-01-8	4.1	6.20E-10	Request	Request	8.26E-12	Request	Request
Total PCBs	1336-36-3	3.01	4.55E-10	2.00E-05	2.27E-05	6.06E-12	2.00E+00	1.21E-11
			Hazard Index:		3.24E-05	Total Cancer Risk:		1.88E-10

Notes:
NC: Risk not calculated. No toxicity value.

800371

Table B-40
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-6 ft. AOC-3: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	66
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-3 Subsurface Soil 0-6 ft. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Arsenic	7440-38-2	3	4.53E-10	3.00E-04	1.51E-06	6.04E-12	1.51E+01	9.13E-11
Benzo(g,h,i)perylene	191-24-2	0.058	8.76E-12	Request	Request	1.17E-13	Request	Request
Phenanthrene	85-01-8	0.43	6.50E-11	Request	Request	8.66E-13	Request	Request
			Hazard Index:		1.51E-06	Total Cancer Risk:		9.13E-11

Notes:
NC: Risk not calculated. No toxicity value.

Table B-41
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-6 ft. AOC-4: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	66
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-4 Subsurface Soil 0-6 ft. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Arsenic	7440-38-2	1.80	2.72E-10	3.00E-04	9.07E-07	3.63E-12	1.51E+01	5.48E-11
			Hazard Index:		9.07E-07	Total Cancer Risk:		5.48E-11

Notes:
NC: Risk not calculated. No toxicity value.

800373

Table B-42
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-6 ft. AOC-5: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	66
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-5 Subsurface Soil 0-6 ft. (mg/kg)	*Noncancer Hazard Quotient*			*Excess Lifetime Cancer Risk*		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Arsenic	7440-38-2	2.40	3.63E-10	3.00E-04	1.21E-06	4.84E-12	1.51E+01	7.30E-11
			Hazard Index:		1.21E-06	Total Cancer Risk:		7.30E-11

Notes:
NC: Risk not calculated. No toxicity value.

Table B-43
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-7 ft. AOC-6: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	66
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$\text{ADD (mg/kg-d)} = \frac{\text{CS x RPM x InhR x ET x EF x ED x CF}}{\text{BW x AT}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-6 Subsurface Soil 0-7 ft. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Arsenic	7440-38-2	1.2	1.81E-10	3.00E-04	6.04E-07	2.42E-12	1.51E+01	3.65E-11
Benzo(a)pyrene	50-32-8	0.25	3.78E-11	--	NC	5.04E-13	3.10E+00	1.56E-12
Benzo(g,h,i)perylene	191-24-2	0.082	1.24E-11	Request	Request	1.65E-13	Request	Request
Phenanthrene	85-01-8	6.5	9.82E-10	Request	Request	1.31E-11	Request	Request
Ethylbenzene	100-41-4	25	3.78E-09	2.90E-01	1.30E-08	5.04E-11	--	NC
Xylenes (Total)	1330-20-7	73	1.10E-08	3.00E-02	3.68E-07	1.47E-10	--	NC
Total PCBs	1336-36-3	16	2.42E-09	2.00E-05	1.21E-04	3.22E-11	2.00E+00	6.45E-11
			Hazard Index:		1.22E-04	Total Cancer Risk:		1.03E-10

Notes:
NC: Risk not calculated. No toxicity value.

800375

Table B-44
Calculation of Potential Risks and Hazard Indices
Utility Worker (RME)
Subsurface Soil 0-6 ft. AOC-BP: Inhalation of Dust
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-d)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
BW: Body Weight (kg)	71.8
RPM: Respirable Particulate Matter (ug/m3)	66
InhR: Inhalation Rate (m3/hr)	1.5
ET: Exposure Time (hr/day)	8
EF: Exposure Frequency (days/year)	5
ED: Exposure Duration (years)	1
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	365
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific
CF: Conversion factor (kg/ug)	1.00E-09

$$ADD\ (mg/kg\text{-}d) = \frac{CS \times RPM \times InhR \times ET \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-BP Subsurface Soil 0-6 ft. (mg/kg)	Noncancer Hazard Quotient			Excess Lifetime Cancer Risk		
			ADD (mg/kg-day)	Chronic RfDi (mg/kg-day)	Soil HQ	ADD (mg/kg-day)	CSFi [1/(mg/kg-day)]	Soil Risk
Aluminum	7429-90-5	8442.08	1.28E-06	1.00E-03	1.28E-03	1.70E-08	--	NC
Arsenic	7440-38-2	66.76	1.01E-08	3.00E-04	3.36E-05	1.35E-10	1.51E+01	2.03E-09
Chromium	7440-47-3	66.76	1.01E-08	1.50E+00	6.73E-09	1.35E-10	--	NC
Iron	7439-89-6	25600	3.87E-06	3.00E-01	1.29E-05	5.16E-08	--	NC
Lead	7439-92-1	83.98	1.27E-08	Request	Request	1.69E-10	Request	Request
Acenaphthylene	208-96-8	0.06	9.57E-12	Request	Request	1.28E-13	Request	Request
Benzo(a)pyrene	50-32-8	0.13	1.99E-11	--	NC	2.65E-13	3.10E+00	8.22E-13
Benzo(g,h,i)perylene	191-24-2	0.09	1.30E-11	Request	Request	1.73E-13	Request	Request
Phenanthrene	85-01-8	0.44	6.63E-11	Request	Request	8.84E-13	Request	Request
Total PCBs	1336-36-3	9.80	1.48E-09	2.00E-05	7.40E-05	1.97E-11	2.00E+00	3.95E-11
			Hazard Index:		1.40E-03	Total Cancer Risk:		2.07E-09

Notes:
NC: Risk not calculated. No toxicity value.

Table B-45a
Calculation of Potential Risks and Hazard Indices
Resident (Adult) (RME)
Ground water AOC-1b: Ingestion
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	2.3
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
SA: Skin Surface Area (cm2/d)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	350
ED: Exposure Duration (years)	24
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	8760
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-1b Ground water (mg/L)	Kp (cm/hr)	OA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Aluminum	7429-90-5	0.855	2.14E-03	0.1	2.63E-03	NA	1.00E+00	1.00E-01	2.63E-03	NA	2.63E-03	8.40E-04	NA	--	--	NC	NA	NC
Thallium	7440-28-0	0.0133	1.57E-04	1	4.09E-04	NA	7.00E-05	7.00E-05	5.84E+00	NA	5.84E+00	1.31E-04	NA	--	--	NC	NA	NC
							Hazard Index:				5.84E+00			Total Cancer Risk:				NA

Notes:
NC: Risk not calculated. No toxicity value.

800377

Table B-45b
Calculation of Potential Risks and Hazard Indices
Resident (Adult) (CTE)
Ground water AOC-1b: Ingestion
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	1.3
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
SA: Skin Surface Area (cm2/d)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	350
ED: Exposure Duration (years)	24
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	8760
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

		AOC-1b			Noncancer Hazard Quotient							Excess Lifetime Cancer Risk						
Compound	CASRN	Ground water (mg/L)	Kp (cm/hr)	OA	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD: Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF: adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Aluminum	7429-90-5	0.855	2.14E-03	0.1	1.48E-03	NA	1.00E+00	1.00E-01	1.48E-03	NA	1.48E-03	4.75E-04	NA	--	--	NC	NA	NC
Thallium	7440-28-0	0.0133	1.57E-04	1	2.31E-04	NA	7.00E-05	7.00E-05	3.30E+00	NA	3.30E+00	7.39E-05	NA	--	--	NC	NA	NC
							Hazard Index:				3.30E+00			Total Cancer Risk:				NA

Notes:
NC: Risk not calculated. No toxicity value.

800378

Table B-46a
Calculation of Potential Risks and Hazard Indices
Resident (Child) (RME)
Ground water AOC-1b: Ingestion
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	1.5
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
SA: Skin Surface Area (cm2/d)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	350
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	14.3
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-1b Ground water (mg/L)	Kp (cm/hr)	OA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Aluminum	7429-90-5	0.855	2.14E-03	0.1	8.60E-03	NA	1.00E+00	1.00E-01	8.60E-03	NA	8.60E-03	6.88E-04	NA	--	--	NC	NA	NC
Thallium	7440-28-0	0.0133	1.57E-04	1	1.34E-03	NA	7.00E-05	7.00E-05	1.91E+01	NA	1.91E+01	1.07E-04	NA	--	--	NC	NA	NC
							Hazard Index:				1.91E+01			Total Cancer Risk:				NA

Notes:
NC: Risk not calculated. No toxicity value.

800379

Table B-46b
Calculation of Potential Risks and Hazard indices
Resident (Child) (CTE)
Ground water AOC-1b: Ingestion
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	0.87
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
SA: Skin Surface Area (cm2/d)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	350
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	14.3
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-1b Ground water (mg/L)	Kp (cm/hr)	OA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Aluminum	7429-90-5	0.855	2.14E-03	0.1	4.99E-03	NA	1.00E+00	1.00E-01	4.99E-03	NA	4.99E-03	3.99E-04	NA	--	--	NC	NA	NC
Thallium	7440-28-0	0.0133	1.57E-04	1	7.76E-04	NA	7.00E-05	7.00E-05	1.11E+01	NA	1.11E+01	6.21E-05	NA	--	--	NC	NA	NC
							Hazard Index:				1.11E+01			Total Cancer Risk:				NA

Notes:
NC: Risk not calculated. No toxicity value.

800380

Table B-47a
Calculation of Potential Risks and Hazard Indices
Resident (Adult) (RME)
Ground water AOC-4: Ingestion
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	2.3
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	350
ED: Exposure Duration (years)	24
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	8760
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

					Noncancer Hazard Quotient							Excess Lifetime Cancer Risk					
Compound	CASRN	AOC-4 Ground water (mg/L)	Kp (cm/hr)	OA	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Arsenic	7440-38-2	0.0073	1.93E-03	0.95	2.13E-04	NA	3.00E-04	3.00E-04	7.10E-01	NA	7.10E-01	6.82E-05	NA	1.50E+00	1.50E+00	1.02E-04	NA	1.02E-04
bis(2-Chloroethyl)ether	111-44-4	0.48	1.80E-03	0.5	7.37E-03	NA	--	--	NC	NA	NC	2.36E-03	NA	1.10E+00	1.10E+00	2.59E-03	NA	2.59E-03
1,1,2,2-Tetrachloroethane	79-34-5	0.01	6.90E-03	0.7	2.15E-04	NA	6.00E-02	6.00E-02	3.58E-03	NA	3.58E-03	6.88E-05	NA	2.00E-01	2.00E-01	1.38E-05	NA	1.38E-05
1,1,2-Trichloroethane	79-00-5	0.002	6.43E-03	0.81	6.07E-05	NA	4.00E-03	4.00E-03	1.52E-02	NA	1.52E-02	1.94E-05	NA	5.70E-02	5.70E-02	1.11E-06	NA	1.11E-06
1,1-Dichloroethene	75-35-4	0.002	1.20E-02	1	6.14E-05	NA	5.00E-02	5.00E-02	1.23E-03	NA	1.23E-03	1.97E-05	NA	--	--	NC	NA	NC
1,2-Dichloroethane	107-06-2	0.032	4.20E-03	1	9.83E-04	NA	2.00E-02	2.00E-02	4.91E-02	NA	4.91E-02	3.15E-04	NA	9.10E-02	9.10E-02	2.86E-05	NA	2.86E-05
Benzene	71-43-2	0.043	1.50E-02	0.97	1.28E-03	NA	4.00E-03	4.00E-03	3.20E-01	NA	3.20E-01	4.10E-04	NA	5.50E-02	5.50E-02	2.25E-05	NA	2.25E-05
Chloroform	67-66-3	0.015	6.80E-03	1	4.61E-04	NA	1.00E-02	1.00E-02	4.61E-02	NA	4.61E-02	1.47E-04	NA	--	--	NC	NA	NC
cis-1,2-Dichloroethene	156-59-2	0.056	1.49E-02	1	1.72E-03	NA	1.00E-02	1.00E-02	1.72E-01	NA	1.72E-01	5.50E-04	NA	--	--	NC	NA	NC
Tetrachloroethene	127-18-4	0.001	3.30E-02	1	2.65E-05	NA	1.00E-02	1.00E-02	2.65E-03	NA	2.65E-03	8.48E-06	NA	5.40E-01	5.40E-01	4.58E-06	NA	4.58E-06
Trichloroethene	79-01-6	0.04	1.20E-02	1	1.18E-03	NA	3.00E-04	3.00E-04	3.93E+00	NA	3.93E+00	3.77E-04	NA	4.00E-01	4.00E-01	1.51E-04	NA	1.51E-04
Vinyl chloride	75-01-4a	0.018	5.60E-03	1	5.53E-04	NA	3.00E-03	3.00E-03	1.84E-01	NA	1.84E-01	1.77E-04	NA	7.20E-01	7.20E-01	1.27E-04	NA	1.27E-04
							Hazard Index:				5.43E+00			Total Cancer Risk:				3.05E-03

Notes:
NC: Risk not calculated. No toxicity value.

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Table B-47b
Calculation of Potential Risks and Hazard indices
Resident (Adult) (CTE)
Ground water AOC-4: Ingestion
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	1.3
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
SA: Skin Surface Area (cm2/d)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	350
ED: Exposure Duration (years)	24
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	8760
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

					Noncancer Hazard Quotient							Excess Lifetime Cancer Risk						
Compound	CASRN	AOC-4 Ground water (mg/L)	Kp (cm/hr)	OA	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Arsenic	7440-38-2	0.0073	1.93E-03	0.95	1.20E-04	NA	3.00E-04	3.00E-04	4.01E-01	NA	4.01E-01	3.85E-05	NA	1.50E+00	1.50E+00	5.78E-05	NA	5.78E-05
bis(2-Chloroethyl)ether	111-44-4	0.48	1.80E-03	0.5	4.17E-03	NA	--	--	NC	NA	NC	1.33E-03	NA	1.10E+00	1.10E+00	1.47E-03	NA	1.47E-03
1,1,2,2-Tetrachloroethane	79-34-5	0.01	6.90E-03	0.7	1.22E-04	NA	6.00E-02	6.00E-02	2.03E-03	NA	2.03E-03	3.89E-05	NA	2.00E-01	2.00E-01	7.78E-06	NA	7.78E-06
1,1,2-Trichloroethane	79-00-5	0.002	6.43E-03	0.81	3.43E-05	NA	4.00E-03	4.00E-03	8.57E-03	NA	8.57E-03	1.10E-05	NA	5.70E-02	5.70E-02	6.25E-07	NA	6.25E-07
1,1-Dichloroethene	75-35-4	0.002	1.20E-02	1	3.47E-05	NA	5.00E-02	5.00E-02	6.94E-04	NA	6.94E-04	1.11E-05	NA	--	--	NC	NA	NC
1,2-Dichloroethane	107-06-2	0.032	4.20E-03	1	5.56E-04	NA	2.00E-02	2.00E-02	2.78E-02	NA	2.78E-02	1.78E-04	NA	9.10E-02	9.10E-02	1.62E-05	NA	1.62E-05
Benzene	71-43-2	0.043	1.50E-02	0.97	7.24E-04	NA	4.00E-03	4.00E-03	1.81E-01	NA	1.81E-01	2.32E-04	NA	5.50E-02	5.50E-02	1.27E-05	NA	1.27E-05
Chloroform	67-66-3	0.015	6.80E-03	1	2.60E-04	NA	1.00E-02	1.00E-02	2.60E-02	NA	2.60E-02	8.33E-05	NA	--	--	NC	NA	NC
cis-1,2-Dichloroethene	156-59-2	0.056	1.49E-02	1	9.72E-04	NA	1.00E-02	1.00E-02	9.72E-02	NA	9.72E-02	3.11E-04	NA	--	--	NC	NA	NC
Tetrachloroethene	127-18-4	0.001	3.30E-02	1	1.50E-05	NA	1.00E-02	1.00E-02	1.50E-03	NA	1.50E-03	4.79E-06	NA	5.40E-01	5.40E-01	2.59E-06	NA	2.59E-06
Trichloroethene	79-01-6	0.038359859	1.20E-02	1	6.66E-04	NA	3.00E-04	3.00E-04	2.22E+00	NA	2.22E+00	2.13E-04	NA	4.00E-01	4.00E-01	8.52E-05	NA	8.52E-05
Vinyl chloride	75-01-4a	0.018	5.60E-03	1	3.13E-04	NA	3.00E-03	3.00E-03	1.04E-01	NA	1.04E-01	1.00E-04	NA	7.20E-01	7.20E-01	7.20E-05	NA	7.20E-05
							Hazard Index:				3.07E+00			Total Cancer Risk:				1.72E-03

Notes:
NC: Risk not calculated. No toxicity value.

Table B-48a
Calculation of Potential Risks and Hazard Indices
Resident (Child) (RME)
Ground water AOC-4: Ingestion
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	1.5
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
RPC: Respirable Particulate Concentration (mg/m3)	NA
SA: Skin Surface Area (cm2/d)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	350
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	14.3
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncance	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-4 Ground water (mg/L)	Kp (cm/hr)	OA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD: Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF: adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Arsenic	7440-38-2	0.0073	1.93E-03	0.95	6.98E-04	NA	3.00E-04	3.00E-04	2.33E+00	NA	2.33E+00	5.58E-05	NA	1.50E+00	1.50E+00	8.37E-05	NA	8.37E-05
bis(2-Chloroethyl)ether	111-44-4	0.48	1.80E-03	0.5	2.41E-02	NA	--	--	NC	NA	NC	1.93E-03	NA	1.10E+00	1.10E+00	2.12E-03	NA	2.12E-03
1,1,2,2-Tetrachloroethane	79-34-5	0.01	6.90E-03	0.7	7.04E-04	NA	6.00E-02	6.00E-02	1.17E-02	NA	1.17E-02	5.63E-05	NA	2.00E-01	2.00E-01	1.13E-05	NA	1.13E-05
1,1,2-Trichloroethane	79-00-5	0.002	6.43E-03	0.81	1.99E-04	NA	4.00E-03	4.00E-03	4.97E-02	NA	4.97E-02	1.59E-05	NA	5.70E-02	5.70E-02	9.06E-07	NA	9.06E-07
1,1-Dichloroethene	75-35-4	0.002	1.20E-02	1	2.01E-04	NA	5.00E-02	5.00E-02	4.02E-03	NA	4.02E-03	1.61E-05	NA	--	--	NC	NA	NC
1,2-Dichloroethane	107-06-2	0.032	4.20E-03	1	3.22E-03	NA	2.00E-02	2.00E-02	1.61E-01	NA	1.61E-01	2.57E-04	NA	9.10E-02	9.10E-02	2.34E-05	NA	2.34E-05
Benzene	71-43-2	0.043	1.50E-02	0.97	4.20E-03	NA	4.00E-03	4.00E-03	1.05E+00	NA	1.05E+00	3.36E-04	NA	5.50E-02	5.50E-02	1.85E-05	NA	1.85E-05
Chloroform	67-66-3	0.015	6.80E-03	1	1.51E-03	NA	1.00E-02	1.00E-02	1.51E-01	NA	1.51E-01	1.21E-04	NA	--	--	NC	NA	NC
cis-1,2-Dichloroethene	156-59-2	0.056	1.49E-02	1	5.63E-03	NA	1.00E-02	1.00E-02	5.63E-01	NA	5.63E-01	4.51E-04	NA	--	--	NC	NA	NC
Tetrachloroethene	127-18-4	0.001	3.30E-02	1	8.67E-05	NA	1.00E-02	1.00E-02	8.67E-03	NA	8.67E-03	6.94E-06	NA	5.40E-01	5.40E-01	3.75E-06	NA	3.75E-06
Trichloroethene	79-01-6	0.038359859	1.20E-02	1	3.86E-03	NA	3.00E-04	3.00E-04	1.29E+01	NA	1.29E+01	3.09E-04	NA	4.00E-01	4.00E-01	1.23E-04	NA	1.23E-04
Vinyl chloride	75-01-4c	0.018	5.60E-03	1	1.81E-03	NA	3.00E-03	3.00E-03	6.04E-01	NA	6.04E-01	1.45E-04	NA	1.40E+00	1.40E+00	2.03E-04	NA	2.03E-04
							Hazard Index:				1.78E+01			Total Cancer Risk:				2.59E-03

Notes:
NC: Risk not calculated. No toxicity value.

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Table B-48b
Calculation of Potential Risks and Hazard indices
Resident (Child) (CTE)
Groundwater AOC-4: Ingestion
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	0.87
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	1
SA: Skin Surface Area (cm2/d)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	350
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	14.3
AT: Averaging Time (days) (75 yr. x 365 days/yr, can	27375
AT: Averaging Time (days) (ED x 365 days/yr, nonca	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

					Noncancer Hazard Quotient							Excess Lifetime Cancer Risk					
Compound	CASRN	AOC-4 Groundwater (mg/L)	Kp (cm/hr)	OA	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Arsenic	7440-38-2	0.0073	1.93E-03	0.95	4.05E-04	NA	3.00E-04	3.00E-04	1.35E+00	NA	1.35E+00	3.24E-05	NA	1.50E+00	1.50E+00	4.85E-05	NA	4.85E-05
bis(2-Chloroethyl)ether	111-44-4	0.48	1.80E-03	0.5	1.40E-02	NA	--	--	NC	NA	NC	1.12E-03	NA	1.10E+00	1.10E+00	1.23E-03	NA	1.23E-03
1,1,2,2-Tetrachloroethan	79-34-5	0.01	6.90E-03	0.7	4.08E-04	NA	6.00E-02	6.00E-02	6.81E-03	NA	6.81E-03	3.27E-05	NA	2.00E-01	2.00E-01	6.53E-06	NA	6.53E-06
1,1,2-Trichloroethane	79-00-5	0.002	6.43E-03	0.81	1.15E-04	NA	4.00E-03	4.00E-03	2.88E-02	NA	2.88E-02	9.22E-06	NA	5.70E-02	5.70E-02	5.25E-07	NA	5.25E-07
1,1-Dichloroethene	75-35-4	0.002	1.20E-02	1	1.17E-04	NA	5.00E-02	5.00E-02	2.33E-03	NA	2.33E-03	9.33E-06	NA	--	--	NC	NA	NC
1,2-Dichloroethane	107-06-2	0.032	4.20E-03	1	1.87E-03	NA	2.00E-02	2.00E-02	9.33E-02	NA	9.33E-02	1.49E-04	NA	9.10E-02	9.10E-02	1.36E-05	NA	1.36E-05
Benzene	71-43-2	0.043	1.50E-02	0.97	2.43E-03	NA	4.00E-03	4.00E-03	6.08E-01	NA	6.08E-01	1.95E-04	NA	5.50E-02	5.50E-02	1.07E-05	NA	1.07E-05
Chloroform	67-66-3	0.015	6.80E-03	1	8.75E-04	NA	1.00E-02	1.00E-02	8.75E-02	NA	8.75E-02	7.00E-05	NA	--	--	NC	NA	NC
cis-1,2-Dichloroethene	156-59-2	0.056	1.49E-02	1	3.27E-03	NA	1.00E-02	1.00E-02	3.27E-01	NA	3.27E-01	2.61E-04	NA	--	--	NC	NA	NC
Tetrachloroethene	127-18-4	0.001	3.30E-02	1	5.03E-05	NA	1.00E-02	1.00E-02	5.03E-03	NA	5.03E-03	4.02E-06	NA	5.40E-01	5.40E-01	2.17E-06	NA	2.17E-06
Trichloroethene	79-01-6	0.038359859	1.20E-02	1	2.24E-03	NA	3.00E-04	3.00E-04	7.46E+00	NA	7.46E+00	1.79E-04	NA	4.00E-01	4.00E-01	7.16E-05	NA	7.16E-05
Vinyl chloride	75-01-4c	0.018	5.60E-03	1	1.05E-03	NA	3.00E-03	3.00E-03	3.50E-01	NA	3.50E-01	8.40E-05	NA	1.40E+00	1.40E+00	1.18E-04	NA	1.18E-04
							Hazard Index:				1.03E+01			Total Cancer Risk:				1.50E-03

Notes:
NC: Risk not calculated. No toxicity value.

Table B-49
Calculation of Potential Exposure
Residential (Adult) (RME)
Ground water AOC 1b: Inhalation (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Inhalation Exposure Factor Equation

$$EXP_{inh} = \frac{S / R_{ae} \times (D_s + e^{\wedge}(-R_{ae}D_t)/R_{ae} - e^{\wedge}R_{ae}(D_s.D_t)/R_{ae}) \times n \times EF_1 \times EF_2 \times EP \times C_3}{AP}$$

Parameter	Definition	Units	Value	Comment
EXPinh	Inhalation Exposure Factor	ug/m3	chemcial specific	
S	Indoor air generation rate	ug/(m3-minute)	chemcial specific	
Rae	Air exchange rate	1/minute	8.33E-03	
Ds	Shower duration	minutes	12	
Dt	Total time in shower room	minutes	20	
n	Number of showers per day	day^{-1}	1	
EF1	Exposure frequency	days/week	7	
EF2	Exposure frequency	weeks/year	50	
EPn	Exposure Period - noncancer	years	24	
EPc	Exposure Period - cancer	years	24	
C3	Conversion Factor	years/minute	1.91E-06	
APn	Averaging Period - noncancer	years	24	
APc	Averaging Period - cancer	years	75	

Compound	Concentration in Ground water	Henry's Law Constant [1]	Molecular Weight	Gas-film mass transfer coefficient[2]	Liquid-film Mass Transfer Coefficient[3]	Overall Mass Transfer Coefficient[4]	Adjusted Mass Transfer Coefficient[5]	Concentration Leaving Water Droplet[6]	Indoor Air Generation Rate [7]	Exposure Factor Noncancer	Exposure Factor Cancer
	C_{gw} ug/L	H atm-m^3/mol	MW g/mole	k_l cm/hr	k_g cm/hr	K_L cm/hr	Ka_L cm/hr	Cwd µg/l	S µg/(m^3-min)	EXPinh-nc µg/m^3	EXPinh-c µg/m^3
Aluminum	8.55E+02	NA	27	2450.33	25.54	NA	NA	NA	NA	NA	NA
Thallium	1.33E+01	NA	204	891.13	9.29	NA	NA	NA	NA	NA	NA

Notes:

(1) Henry's Law Constant (obtained from J&E inputs file)

(2) Gas-film mass transfer coefficient calculated using the equation $k_g = k_g(H2O)$ x squareroot (MW H_2O/ MW contaminant), where $k_g(H_2O)$ is 3000 cm/hour, and the MW of H_2O is 18 g/mol.

(3) Liquid-film Mass Transfer Coefficient calculated using the equation $k_l = k_l(CO_2)$ x squareroot (MW CO_2/ MW contaminant), where $k_l(CO_2)$ is 20 cm/hour, and the MW of CO_2 is 44 g/mol.

(4) Overall Mass Transfer Coefficient is calculated using the equation $K_L = (1/k_l + (R \times T / H \times k_g)^{\wedge} -1)$, where k_l is the liquid film mass tranfer coefficient, R is the universal gas constant (8.2e-5 atm-m^3/mol-K), T is the air temperature (293°K) , H is the Henry's law constant, and k_g is the gas-film mass transfer coefficient.

(5) Adjusted Mass Transfer Coefficient calculated using the equation $K_{aL} = K_L$ x Squareroot $((T_l \times u_s)/(T_s \times u_l))$ where KL= the overall mass transer coefficient, T_l is the calibration temperature of water (293°K), u_s is the viscosity of water at T_s (0.596 cp) and T_s is the shower water temperature (318°K) and u_l is the water viscosity at T_l (1.002 cp)

(6) Concentration Leaving Water Droplet calculated using the equation $C_{wd} = C_{wd}(1-e^{\wedge}(-K_{aL} \times t_s/60d))$ where C_w is the shower water concentration, KaL is the adjusted mass transfer coefficient, t_s is the shower droplet time (2 seconds) and 60d is the specific interfacial area 6/d for a spherical droplet of diameter d (mm), multiplied by conversion factors hr/3600 sec and 10 mm/cm.

(7) Indoor Air Generation Rate (S) calculated using the equation $S = C_{wd}$ x FR / SV, where C_{wd} is the concentration leaving the water droplet, FR is the shower flow rate (10 L/minute) and SV is the shower room volume (6 m^3)

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Table B-50
Calculation of Potential Risks and Hazard Indices
Residential (Adult) (RME)
Ground water AOC 1b: Inhalation (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Inhalation Risk Calculations

$$HI_{inh} = \frac{EXP_{inh\text{-}nc}}{RfC \times CF}$$

$$Risk_{inh} = EXP_{inh\text{-}c} \times UR_i$$

Receptor:	*Resident - Adult*
Medium:	Ground water
Exposure Area:	AOC-1b
Depth:	All depths
Duration:	Chronic

Parameter	Definition	Units	Value
$EXP_{inh\text{-}nc}$	Exposure Factor noncancer	µg/m3	Chemical specific
$EXP_{inh\text{-}c}$	Exposure Factor cancer	µg/m3	Chemical specific
CF	Conversion Factor	ug/mg	1000

Compound	EPC C_{gw} ug/l	Exposure Factor Noncancer $EXP_{inh\text{-}nc}$ µg/m^3	RfC (mg/m^3)	Hazard Index	Exposure factor Cancer Risk $EXP_{inh\text{-}c}$ µg/m3	Inhalation Unit Risk (ug/m3)-1	Cancer Risk
Aluminum	8.55E+02	NA	3.50E-03	NC	NA	--	NC
Thallium	1.33E+01	NA	2.45E-04	NC	NA	--	NC
Total			Hazard	NA		**Risk**	NA

Table B-51
Calculation of Potential Exposure
Residential (Adult) (RME)
Ground water AOC 1b: Dermal (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Dermal Exposure Equations

Non-steady state ($t_{event} < t^*$)	$DA = 2 \times FA \times K_P \times C_{gw} \times CF \times (\text{Squareroot}((6 \times \tau \times t_{event})/\pi))$
Steady state ($t_{event} < t^*$)	$DA = FA \times K_P \times C_{gw} \times CF \times ((t_{event}/(1+B))+2 \times \tau \times ((1+3 \times B+ (3 \times B^2)/(1+B)^2))$
Inorganic chemical	$DA = C_{gw} \times Kp \times CF \times t_{event}$

Parameter	Definition	Units	Value	Source / Comment
DA	Dose absorbed per unit area per water contact event	mg/cm^2-event	chemical specific calculated below	
FA	Fraction of absorbed water	unitless	chemical specific	obtained from RAGS Part E appendix B
C_{gw}	Concentration in Ground water water	ug/L (i.e. mg/m^3)	chemical specific	
t_{event}	Duration of exposure	hour/event	0.20	
K_P	Dermal permeability coefficient	cm/hr	chemical specific	
τ	Lag time	hr/event	chemical specific calculated below	
π	Ratio of the circumference of a circle to its diameter	unitless	3.14	
B	Relative contribution of permeability coefficient	unitless	chemical specific calculated below	
t*	Time to reach steady-state	hour	chemical specific calculated below	
CF	Conversion factor	m^3/cm^3	0.000001	

Compound	EPC C_{gw} mg/m^3	Fraction of Absorbed Dose (1) FA unitless	Relative Contribution of Permeability Coefficient (2) B unitless	Lag Time (3) τ hours/event	Effective Diffusivity of Chemical Transfer Through Skin (4) Dsc cm^2/hr	Time to Reach Steady-state (5) t* hours	t* when B>0.6 (6)	b (7)	c (8)	Equation used to Calculate DA (9) DA	Outside Effective Predictive Domain	Dermal Multiplier for Chemicals Outside Effective DM unitless	Dose Absorbed per Water Contact Event (10) DA_{event} mg/cm^2-event
Aluminum	8.55E+02	1	4.28E-03	0.149	1.12E-06	0.36		3.1E-01	3.4E-01	Inorganic			3.66E-07
Thallium	1.33E+01	1	8.62E-04	1.460	1.14E-07	3.50		3.0E-01	3.3E-01	Inorganic			4.18E-10

Notes:

(1) Fraction of Absorbed Dose (FA), RAGS Part E 2000 Appendix B, or assumed a default of 1.

(2) Relative Contribution of Permeability Coefficient (B), the ratio of permeability of chemcial in stateum corneum to permeability of chemcial in viable epidermis (dimentionless) calculated using the equation B = Kp x squareroot(MW)/2.6.

(3) Lag Time - The time after initial contact for chemical to cross stratum corneum. Calculated using equation $\tau = l_{sc}^2 / 6 \times D_{sc}$, where l_{sc} is the thickness of the skin (0.001 cm).

(4) Effective Diffusivity of Chemical Transfer Through Skin (D_{sc}) calculated using the equation $D_{sc} = 10^{-2.8-(0.0056 \times MW)} \times l_{sc}$, where l_{sc} is the thickness of the skin (0.001 cm).

(5) Time to Reach Steady-state (t*) when B < or = 0.6 calculated using the equation $t^* = 2.4 \times \tau$, when B > 0.6, t* is calculated using the equation $t^* = (b - \text{squareroot}(b^2-c^2)) \times l_{sc}^2/D_{sc}$, where l_{sc} is the thickness of the skin (0.001 cm) and other parameters defined above.

(6) t* when B > 0.6, t* is calculated using the equation $t^* = (b - \text{squareroot}(b^2-c^2)) \times l_{sc}^2/D_{sc}$, where l_{sc} is the thickness of the skin (0.001 cm) and other parameters defined above.

(7) The empirical value b is calculated using the equation $b = (2 \times (1+B)^2 / \pi) - c$

(8) The empirical value c is calculated using the equation $c = (1+ 3B + 3B^2) / (3 \times (1 + B))$

(9) Equation used to Calculate DA; SS steadystate, NSS non-steady state, Inorganic or Other for chemcials that are outside the effective predictive domain.

(10) Dose Absorbed per Unit Area per Water Contact Event

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Table B-52
Calculation of Potential Risks and Hazard Indices
Residential (Adult) (RME)
Ground water AOC 1b: Dermal (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Receptor:	Resident-Adult
Medium:	Ground water
Exposure Area:	AOC-1b
Depth:	All depths
Duration:	Chronic

Dermal Risk Calculations

Noncancer

Within predicted domain;

$$ADD_{der} = \frac{DA \times SA \times EF_{event} \times EF \times EP}{AP \times BW}$$

Outside predicted domain;

$$ADD_{der} = C_{gw} \times DWEF \times DM$$

$$HI_{der} = \frac{ADD_{der\text{-}nc}}{RfD_{der}}$$

Cancer

Within predicted domain;

$$LDI = \frac{DA \times SA \times EF_{event} \times EF \times EP}{AP \times BW}$$

Outside predicted domain;

$$LDI = C_{gw} \times DWEF \times DM$$

$$Risk_{der} = LDI_{der} \times CSF_{der}$$

Parameter	Definition	Units	Value - noncancer	Value - cancer
ADD_{der}	Average daily dose dermal	mg/kg-day		
LDI_{der}	Lifetime daily intake	mg/kg-day		
DA	Dose absorbed per water contact event	mg/cm^2-event	Chemical specific	Chemical specific
SA	Surface area	cm^2	20000	20000
EF_{event}	Exposure event frequency	events/day	1	1
EF	Exposure frequency	days/year	350	350
EP	Exposure period	years	24	24
BW	Body weight	kg	71.8	71.8
DWEF[(1)]	Drinking water exposure factor		--	9.83E-06
AP	Averaging period	days	2190	27375

Compound	$Concentration_{gw}$ C_{gw} (mg/m^3)	Dermal Multiplier for Chemicals Outside Effective Predictive Domain DM (unitless)	Dose Absorbed per Unit Area per Water Contact Event DA (mg/cm^2-event)	Average daily dose dermal ADD_{der} (mg/kg-day)	Dermal Chronic Reference Dose (mg/kg-day) RfD_{der} (mg/kg-day)	Hazard Quotient HI_{der}	Lifetime Daily Intake LDI_{der} (mg/kg-day)	Dermal Cancer Slope Factor CSF_{der} $(mg/kg\text{-}day)^{-1}$	Cancer Risk $Risk_{der}$
Aluminum	8.55E+02		3.66E-07	3.91E-04	1.00E-01	4E-03	3.13E-05	--	NC
Thallium	1.33E+01		4.18E-10	4.46E-07	7.00E-05	6E-03	3.57E-08	--	NC
Total					**Hazard**	**1.E-02**		**Risk**	**NA**

(1) DWEF Drinking Water Exposure Factor (L-mg)/(kg-ug-d) is the sum of age specific exposures calculated as (IR x EF x EP x Conversion factors of 0.001 mg/ug and 0.002739 years/day) / (BW x AP), using BW of 71.8 kg, Intake rate of 2.3 L/day, and EP of 24 years.

Table B-53
Calculation of Potential Exposure
Residential (Child) (RME)
Ground water AOC 1b: Inhalation (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Inhalation Exposure Factor Equation

$$EXP_{inh} = \frac{S / R_{ae} \times (D_s + e^{(-R_{ae}D_t)}/R_{ae} - e^{R_{ae}(D_s-D_t)}/R_{ae}) \times n \times EF_1 \times EF_2 \times EP \times C_3}{AP}$$

Parameter	Definition	Units	Value	Comment
EXPinh	Inhalation Exposure Factor	ug/m3	chemcial specific	
S	Indoor air generation rate	ug/(m3-minute)	chemcial specific	
Rae	Air exchange rate	1/minute	8.33E-03	
Ds	Shower duration	minutes	12	
Dt	Total time in shower room	minutes	20	
n	Number of showers per day	day^{-1}	1	
EF1	Exposure frequency	days/week	7	
EF2	Exposure frequency	weeks/year	50	
EPn	Exposure Period - noncancer	years	6	
EPc	Exposure Period - cancer	years	6	
C3	Conversion Factor	years/minute	1.91E-06	
APn	Averaging Period - noncancer	years	6	
APc	Averaging Period - cancer	years	75	

Compound	Concentration in Ground water	Henry's Law Constant [1]	Molecular Weight	Gas-film mass transfer coefficient[2]	Liquid-film Mass Transfer Coefficient[3]	Overall Mass Transfer Coefficient[4]	Adjusted Mass Transfer Coefficient[5]	Concentration Leaving Water Droplet[6]	Indoor Air Generation Rate [7]	Exposure Factor Noncancer	Exposure Factor Cancer
	C_{gw} ug/L	H atm-m^3/mol	MW g/mole	k_l cm/hr	k_g cm/hr	K_L cm/hr	Ka_L cm/hr	Cwd µg/l	S µg/(m^3-min)	EXPinh-nc µg/m^3	EXPinh-c µg/m^3
Aluminum	8.55E+02	NA	27	2450.33	25.54	NA	NA	NA	NA	NA	NA
Thallium	1.33E+01	NA	204	891.13	9.29	NA	NA	NA	NA	NA	NA

Notes:

(1) Henry's Law Constant (obtained from J&E inputs file)

(2) Gas-film mass transfer coefficient calculated using the equation $k_g = k_g(H2O)$ x squareroot (MW H_2O/ MW contaminant), where $k_g(H_2O)$ is 3000 cm/hour, and the MW of H_2O is 18 g/mol.

(3) Liquid-film Mass Transfer Coefficient calculated using the equation $k_l = k_l(CO_2)$ x squareroot (MW CO_2/ MW contaminant), where $k_l(CO_2)$ is 20 cm/hour, and the MW of CO_2 is 44 g/mol.

(4) Overall Mass Transfer Coefficient is calculated using the equation $K_L = (1/k_l + (R \times T / H \times k_g)^{-1})$, where k_l is the liquid film mass tranfer coefficient, R is the universal gas constant (8.2e-5 atm-m^3/mol-K), T is the air temperature (293°K) , H is the Henry's law constant, and k_g is the gas-film mass transfer coefficient.

(5) Adjusted Mass Transfer Coefficient calculated using the equation $K_{aL} = K_L$ x Squareroot $((T_l \times u_s)/(T_s \times u_l))$ where KL= the overall mass transer coefficient, T_l is the calibration temperature of water (293°K), u_s is the viscosity of water at T_s (0.596 cp) and T_s is the shower water temperature (318°K) and u_l is the water viscosity at T_l (1.002 cp)

(6) Concentration Leaving Water Droplet calculated using the equation $C_{wd} = C_{wo}(1-e^{(-K_{aL} \times t_s/60d)})$ where C_w is the shower water concentration, KaL is the adjusted mass transfer coefficient, t_s is the shower droplet time (2 seconds) and 60d is the specific interfacial area 6/d for a spherical droplet of diameter d (mm), multiplied by conversion factors hr/3600 sec and 10 mm/cm.

(7) Indoor Air Generation Rate (S) calculated using the equation $S = C_{wd} \times FR / SV$, where C_{wd} is the concentration leaving the water droplet, FR is the shower flow rate (10 L/minute) and SV is the shower room volume (6 m^3)

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Table B-54
Calculation of Potential Risks and Hazard Indices
Residential (Child) (RME)
Ground water AOC 1b: Inhalation (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Inhalation Risk Calculations

$$HI_{inh} = \frac{EXP_{inh\text{-}nc}}{RfC \times CF}$$

$$Risk_{inh} = EXP_{inh\text{-}c} \times UR_i$$

Receptor:	Resident-Child
Medium:	Ground water
Exposure Area:	AOC-1b
Depth:	All depths
Duration:	Chronic

Parameter	Definition	Units	Value
$EXP_{inh\text{-}nc}$	Exposure Factor noncancer	µg/m3	Chemical specific
$EXP_{inh\text{-}c}$	Exposure Factor cancer	µg/m3	Chemical specific
CF	Conversion Factor	ug/mg	1000

Compound	EPC C_{gw} ug/l	Exposure Factor Noncancer $EXP_{inh\text{-}nc}$ µg/m^3	RfC (mg/m^3)	Hazard Index	Exposure factor Cancer Risk $EXP_{inh\text{-}c}$ µg/m3	Inhalation Unit Risk (ug/m3)-1	Cancer Risk
Aluminum	8.55E+02	NA	3.50E-03	NC	NA	--	NC
Thallium	1.33E+01	NA	2.45E-04	NC	NA	--	NC
Total			Hazard	NA		**Risk**	NA

Table B-55
Calculation of Potential Exposure
Residential (Child) (RME)
Ground water AOC 1b: Dermal (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Dermal Exposure Equations

Non-steady state ($t_{event} < t^*$)	$DA = 2 \times FA \times K_P \times C_{gw} \times CF \times (\text{Squareroot}((6 \times \tau \times t_{event})/\pi))$
Steady state ($t_{event} < t^*$)	$DA = FA \times K_P \times C_{gw} \times CF \times ((t_{event}/(1+B)) + 2 \times \tau \times ((1+3 \times B + (3 \times B^2)/(1+B)^2))$
Inorganic chemical	$DA = C_{gw} \times Kp \times CF \times t_{event}$

Parameter	Definition	Units	Value	Source / Comment
DA	Dose absorbed per unit area per water contact event	mg/cm^2-event	chemical specific calculated below	
FA	Fraction of absorbed water	unitless	chemical specific	obtained from RAGS Part E appendix B
C_{gw}	Concentration in Ground water water	ug/L (i.e. mg/m^3)	chemical specific	
t_{event}	Duration of exposure	hour/event	0.53	
K_p	Dermal permeability coefficient	cm/hr	chemical specific	
τ	Lag time	hr/event	chemical specific calculated below	
π	Ratio of the circumference of a circle to its diameter	unitless	3.14	
B	Relative contribution of permeability coefficient	unitless	chemical specific calculated below	
t^*	Time to reach steady-state	hour	chemical specific calculated below	
CF	Conversion factor	m^3/cm^3	0.000001	

Compound	EPC Maximum of Means C_{gw} mg/m³	Fraction of Absorbed Dose (1) FA unitless	Relative Contribution of Permeability Coefficient (2) B unitless	Lag Time (3) τ hours/event	Effective Diffusivity of Chemical Transfer Through Skin (4) Dsc cm^2/hr	Time to Reach Steady-state (5) t^* hours	t* when B>0.6 (6)	b (7)	c (8)	Equation used to Calculate DA (9) DA	Dose Absorbed per Unit Area per Water Contact Event (10) DA_{event} mg/cm²-event
Aluminum	8.55E+02	1	4.28E-03	0.149	1.12E-06	0.36		3.1E-01	3.4E-01	Inorganic	9.76E-07
Thallium	1.33E+01	1	8.62E-04	1.460	1.14E-07	3.50		3.0E-01	3.3E-01	Inorganic	1.11E-09

Notes:

(1) Fraction of Absorbed Dose (FA), RAGS Part E 2000 Appendix B, or assumed a default of 1.

(2) Relative Contribution of Permeability Coefficient (B), the ratio of permeability of chemcial in stateum corneum to permeability of chemcial in viable epidermis (dimentionless) calculated using the equation B = Kp x squareroot(MW)/2.6.

(3) Lag Time - The time after initial contact for chemical to cross stratum corneum. Calculated using equation $\tau = l_{sc}^2 / 6 \times D_{sc}$, where l_{sc} is the thickness of the skin (0.001 cm).

(4) Effective Diffusivity of Chemical Transfer Through Skin (D_{sc}) calculated using the equation $D_{sc} = 10^{-2.8-(0.0056 \times MW)} \times l_{sc}$, where l_{sc} is the thickness of the skin (0.001 cm).

(5) Time to Reach Steady-state (t^*) when B < or = 0.6 calculated using the equation $t^* = 2.4 \times \tau$, when B > 0.6, t^* is calculated using the equation $t^* = (b - \text{squareroot}(b^2 - c^2)) \times l_{sc}^2 / D_{sc}$, where l_{sc} is the thickness of the skin (0.001 cm) and other parameters defined above.

(6) t^* when B > 0.6, t^* is calculated using the equation $t^* = (b - \text{squareroot}(b^2 - c^2)) \times l_{sc}^2 / D_{sc}$, where l_{sc} is the thickness of the skin (0.001 cm) and other parameters defined above.

(7) The empirical value b is calculated using the equation $b = (2 \times (1+B)^2 / \pi) - c$

(8) The empirical value c is calculated using the equation $c = (1 + 3B + 3B^2) / (3 \times (1 + B))$

(9) Equation used to Calculate DA; SS steadystate, NSS non-steady state, Inorganic or Other for chemcials that are outside the effective predictive domain.

(10) Dose Absorbed per Unit Area per Water Contact Event

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Table B-56

Calculation of Potential Risks and Hazard Indices
Residential (Child) (RME)
Ground water AOC 1b: Dermal (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Receptor:	Resident-Child
Medium:	Ground water
Exposure Area:	AOC-1b
Depth:	All depths
Duration:	Chronic

Dermal Risk Calculations

Noncancer

Within predicted domain;

$$ADD_{der\text{-}nc} = \frac{DA \times SA \times EF_{event} \times EF \times EP}{AP \times BW}$$

Outside predicted domain;

$$ADD_{der} = C_{gw} \times DWEF \times DM$$

$$HI_{der} = \frac{ADD_{der\text{-}nc}}{RfD_{der}}$$

Cancer

Within predicted domain;

$$LDI = DA \times DWDF$$

Outside predicted domain;

$$LDI = C_{gw} \times DWEF \times DM$$

$$Risk_{der} = LDI_{der} \times CSF_{der}$$

Parameter	*Definition*	*Units*	*Value - noncancer*	*Value - cancer*
ADD_{der}	Average daily dose dermal	mg/kg-day		
LDI_{der}	Lifetime daily intake	mg/kg-day		
DA	Dose absorbed per unit area per water contact event	mg/cm^2-event	Chemical specific	Chemical specific
SA	Surface area	cm^2	6880	6880
EF_{event}	Exposure event frequency	events/day	1	1
EF	Exposure frequency	days/year	350	350
EP	Exposure period	years	6	75
BW	Body weight	kg	14.3	14.3
DWEF(1)	Drinking water exposure factor		6.71E-05	6.71E-05
DWDF(2)	Drinking water dermal factor	(cm2*event)/(kg*day)	-	461
AP	Averaging time	days	2190	27375

Compound	C_{gw} (mg/m^3)	Dermal Multiplier for Chemicals Outside Effective Predictive Domain DM (unitless)	DA (mg/cm^2-event)	ADD_{der} (mg/kg-day)	RfD_{der} (mg/kg-day)	HI_{der}	LDI_{der} (mg/kg-day)	CSF_{der} $(mg/kg\text{-}day)^{-1}$	$Risk_{der}$
	Concentration$_{gw}$		Dose Absorbed per Unit Area per Water Contact Event	Average daily dose dermal	Dermal Chronic Reference Dose (mg/kg-day)	Hazard Quotient	Lifetime Daily Intake	Dermal Cancer Slope Factor	Cancer Risk
Aluminum	8.55E+02		9.76E-07	4.50E-04	1.00E-01	5E-03	4.50E-04	--	NC
Thallium	1.33E+01		1.11E-09	5.14E-07	7.00E-05	7E-03	5.14E-07	--	NC
Total					Hazard	1.E-02		Risk	NA

(1) DWDF Drinking Water Exposure Factor (L-mg)/(kg-ug-d) is the sum of age specific exposures calculated as (IR x EF x EP x Conversion factors of 0.001 mg/ug and 0.002739 years/day) / (BW x AP), for ages ranges 1-5, 6-15 and 16-29 years using BWs of 14.3, 34.1 and 57.61 kg, Intake rates of 1.5, 2.3, and 2.3 L/day, and EPs of 6, 10 and 14 years, respectively.

(2) DWDF Drinking Water Dermal Factor (cm^2-event)/(kg-day) is the sum of age specific exposures calculated as (SA x EF x EP x Conversion factor of 0.002739 years/day) / (BW x AP), for ages ranges 1-5, 6-15 and 16-29 years using BWs of 14.3, 34.1 and 57.61 kg, Intake rates of 1.5, 2.3, and 2.3 L/day, and EPs of 6, 10 and 14 years, respectively.

Table B-57
Calculation of Potential Exposure
Residential (Adult) (RME)
Ground water AOC 4: Inhalation (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Inhalation Exposure Factor Equation

$$EXP_{inh} = \frac{S / R_{ae} \times (D_s + e^{(-R_{ae}D_t)/R_{ae}} - e^{R_{ae}(D_s.D_t)/R_{ae}}) \times n \times EF_1 \times EF_2 \times EP \times C_3}{AP}$$

Parameter	Definition	Units	Value	Comment
EXPinh	Inhalation Exposure Factor	ug/m3	chemcial specific	
S	Indoor air generation rate	ug/(m3-minute)	chemcial specific	
Rae	Air exchange rate	1/minute	8.33E-03	
Ds	Shower duration	minutes	12	
Dt	Total time in shower room	minutes	20	
n	Number of showers per day	day^{-1}	1	
EF1	Exposure frequency	days/week	7	
EF2	Exposure frequency	weeks/year	50	
EPn	Exposure Period - noncancer	years	24	
EPc	Exposure Period - cancer	years	24	
C3	Conversion Factor	years/minute	1.91E-06	
APn	Averaging Period - noncancer	years	24	
APc	Averaging Period - cancer	years	75	

Compound	Concentration In Ground water	Henry's Law Constant [1]	Molecular Weight	Gas-film mass transfer coefficient[2]	Liquid-film Mass Transfer Coefficient[3]	Overall Mass Transfer Coefficient[4]	Adjusted Mass Transfer Coefficient[5]	Concentration Leaving Water Droplet[6]	Indoor Air Generation Rate [7]	Exposure Factor Noncancer	Exposure Factor Cancer
	C_{gw} ug/L	H atm-m^3/mol	MW g/mole	k_l cm/hr	k_g cm/hr	K_L cm/hr	Ka_L cm/hr	Cwd µg/l	S µg/(m^3-min)	EXPinh-nc µg/m^3	EXPinh-c µg/m^3
Arsenic	7.30E+00	NA	75	1469.69	15.32	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	4.80E+02	1.80E-05	143	1064.36	11.09	7.42E-01	1.00E+00	1.58E+01	2.63E+01	2.78E+00	8.89E-01
1,1,2,2-Tetrachloroethane	1.00E+01	3.44E-04	168	981.98	10.24	5.92E+00	8.00E+00	2.34E+00	3.90E+00	4.12E-01	1.32E-01
1,1,2-Trichloroethane	2.44E+00	9.11E-04	133	1103.65	11.50	9.02E+00	1.22E+01	8.14E-01	1.36E+00	1.43E-01	4.59E-02
1,1-Dichloroethene	2.00E+00	2.60E-02	97	1292.32	13.47	1.33E+01	1.80E+01	9.03E-01	1.51E+00	1.59E-01	5.09E-02
1,2-Dichloroethane	3.20E+01	9.77E-04	99	1279.20	13.33	1.06E+01	1.43E+01	1.22E+01	2.03E+01	2.14E+00	6.85E-01
Benzene	4.30E+01	5.54E-03	78	1441.15	15.02	1.44E+01	1.94E+01	2.05E+01	3.41E+01	3.61E+00	1.15E+00
Chloroform	1.50E+01	3.66E-03	119	1166.77	12.16	1.14E+01	1.54E+01	6.02E+00	1.00E+01	1.06E+00	3.39E-01
cis-1,2-Dichloroethene	5.60E+01	4.07E-03	97	1292.32	13.47	1.27E+01	1.71E+01	2.44E+01	4.06E+01	4.29E+00	1.37E+00
Tetrachloroethene	8.62E-01	1.84E-02	166	987.88	10.30	1.02E+01	1.37E+01	3.17E-01	5.28E-01	5.57E-02	1.78E-02
Trichloroethene	3.84E+01	1.03E-02	131	1112.04	11.59	1.13E+01	1.53E+01	1.53E+01	2.55E+01	2.70E+00	8.63E-01
Vinyl chloride	1.80E+01	2.69E-02	63	1603.57	16.71	1.66E+01	2.24E+01	9.46E+00	1.58E+01	1.67E+00	5.33E-01

Notes:

(1) Henry's Law Constant (obtained from J&E inputs file)

(2) Gas-film mass transfer coefficient calculated using the equation $k_g = k_g(H2O)$ x squareroot (MW H_2O/ MW contaminant), where $k_g(H_2O)$ is 3000 cm/hour, and the MW of H_2O is 18 g/mol.

(3) Liquid-film Mass Transfer Coefficient calculated using the equation $k_l = k_l(CO_2)$ x squareroot (MW CO_2/ MW contaminant), where $k_l(CO_2)$ is 20 cm/hour, and the MW of CO_2 is 44 g/mol.

(4) Overall Mass Transfer Coefficient is calculated using the equation $K_L = (1/k_l + (R \times T / H \times k_g)^{-1})$, where k_l is the liquid film mass tranfer coefficient, R is the universal gas constant (8.2e-5 atm-m^3/mol-K), T is the air temperature (293°K) , H is the Henry's law constant, and k_g is the gas-film mass transfer coefficient.

(5) Adjusted Mass Transfer Coefficient calculated using the equation $K_{aL} = K_L$ x Squareroot $((T_l \times u_s)/(T_s \times u_l))$ where KL= the overall mass transer coefficient, T_l is the callbration temperature of water (293°K), u_s is the viscosity of water at T_s (0.596 cp) and T_s is the shower water temperature (318°K) and u_l is the water viscosity at T_l (1.002 cp)

(6) Concentration Leaving Water Droplet calculated using the equation $C_{wd} = C_{w0}(1-e^{(-K_{aL} \times t_s/60d)})$ where C_w is the shower water concentration, KaL is the adjusted mass transfer coefficient, t_s is the shower droplet time (2 seconds) and 60d is the specific interfacial area 6/d for a spherical droplet of diameter d (mm), multiplied by conversion factors hr/3600 sec and 10 mm/cm.

(7) Indoor Air Generation Rate (S) calculated using the equation $S = C_{wd}$ x FR / SV, where C_{wd} is the concentration leaving the water droplet, FR is the shower flow rate (10 L/minute) and SV is the shower room volume (6 m^3)

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Table B-58
Calculation of Potential Risks and Hazard Indices
Residential (Adult) (RME)
Ground water AOC 4: Inhalation (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Inhalation Risk Calculations

$$HI_{inh} = \frac{EXP_{inh\text{-}nc}}{RfC \times CF}$$

$$Risk_{inh} = EXP_{inh\text{-}c} \times UR_i$$

Receptor:	Resident-Adult
Medium:	Ground water
Exposure Area:	AOC-4
Depth:	All depths
Duration:	Chronic

Parameter	Definition	Units	Value
$EXP_{inh\text{-}nc}$	Exposure Factor noncancer	µg/m3	Chemical specific
$EXP_{inh\text{-}c}$	Exposure Factor cancer	µg/m3	Chemical specific
CF	Conversion Factor	ug/mg	1000

Compound	EPC C_{gw} ug/l	Exposure Factor Noncancer $EXP_{inh\text{-}nc}$ µg/m^3	RfC (mg/m^3)	Hazard Index	Exposure factor Cancer Risk $EXP_{inh\text{-}c}$ µg/m3	Inhalation Unit Risk (ug/m3)-1	Cancer Risk
Arsenic	7.30E+00	NA	1.05E-03	NC	NA	--	NC
bis(2-Chloroethyl)ether	4.80E+02	2.78E+00	--	NC	8.89E-01	3.30E-04	2.93E-04
1,1,2,2-Tetrachloroethane	1.00E+01	4.12E-01	2.10E-01	1.96E-03	1.32E-01	5.80E-05	7.65E-06
1,1,2-Trichloroethane	2.44E+00	1.43E-01	1.40E-02	1.02E-02	4.59E-02	1.60E-05	7.34E-07
1,1-Dichloroethene	2.00E+00	1.59E-01	2.10E-01	7.57E-04	5.09E-02	--	NC
1,2-Dichloroethane	3.20E+01	2.14E+00	4.90E-03	4.37E-01	6.85E-01	2.60E-05	1.78E-05
Benzene	4.30E+01	3.61E+00	3.01E-02	1.20E-01	1.15E+00	7.80E-06	9.00E-06
Chloroform	1.50E+01	1.06E+00	4.90E-02	2.16E-02	3.39E-01	2.30E-05	7.80E-06
cis-1,2-Dichloroethene	5.60E+01	4.29E+00	3.50E-02	1.23E-01	1.37E+00	--	NC
Tetrachloroethene	8.62E-01	5.57E-02	4.90E-01	1.14E-04	1.78E-02	3.00E-06	5.35E-08
Trichloroethene	3.84E+01	2.70E+00	3.50E-02	7.70E-02	8.63E-01	1.10E-04	9.49E-05
Vinyl chloride	1.80E+01	1.67E+00	9.80E-02	1.70E-02	5.33E-01	8.80E-06	4.69E-06
Total			**Hazard**	8.08E-01		**Risk**	4.36E-04

Table B-59
Calculation of Potential Exposure
Residential (Adult) (RME)
Ground water AOC 4: Dermal (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Dermal Exposure Equations

Non-steady state ($t_{event} < t^*$)	$DA = 2 \times FA \times K_{P} \times C_{gw} \times CF \times (\text{Squareroot}((6 \times \tau \times t_{event})/\pi))$
Steady state ($t_{event} < t^*$)	$DA = FA \times K_p \times C_{gw} \times CF \times ((t_{event}/(1+B))+2 \times \tau \times ((1+3 \times B+ (3 \times B^2)/(1+B)^2))$
Inorganic chemical	$DA = C_{gw} \times Kp \times CF \times t_{event}$

Parameter	Definition	Units	Value	Source / Comment
DA	Dose absorbed per unit area per water contact event	mg/cm^2-event	chemical specific calculated below	
FA	Fraction of absorbed water	unitless	chemical specific	obtained from RAGS Part E appendix B
C_{gw}	Concentration in Ground water water	ug/L (i.e. mg/m^3)	chemical specific	
t_{event}	Duration of exposure	hour/event	0.20	
K_p	Dermal permeability coefficient	cm/hr	chemical specific	
τ	Lag time	hr/event	chemical specific calculated below	
π	Ratio of the circumference of a circle to its diameter	unitless	3.14	
B	Relative contribution of permeability coefficient	unitless	chemical specific calculated below	
t^*	Time to reach steady-state	hour	chemical specific calculated below	
CF	Conversion factor	m^3/cm^3	0.000001	

Compound	EPC C_{gw} mg/m^3	Fraction of Absorbed Dose (1) FA unitless	Relative Contribution of Permeability Coefficient (2) B unitless	Lag Time (3) τ hours/event	Effective Diffusivity of Chemical Transfer Through Skin (4) Dsc cm^2/hr	Time to Reach Steady-state (5) t^* hours	t* when B>0.6 (6)	b (7)	c (8)	Equation used to Calculate DA (9) DA	Outside Effective Predictive Domain	Dermal Multiplier for Chemicals Outside Effective DM unitless	Dose Absorbed per Water Contact Event (10) DA_{event} mg/cm^2-event
Arsenic	7.30E+00	1	6.43E-03	0.277	6.03E-07	0.66		3.1E-01	3.4E-01	Inorganic			2.82E-09
bis(2-Chloroethyl)ether	4.80E+02	1	8.28E-03	0.665	2.51E-07	1.60		3.1E-01	3.4E-01	NSS			2.27E-05
1,1,2,2-Tetrachloroethane	1.00E+01	1	3.44E-02	0.918	1.82E-07	2.20		3.2E-01	3.6E-01	NSS			7.93E-08
1,1,2-Trichloroethane	2.44E+00	1	2.85E-02	0.584	2.85E-07	1.40		3.2E-01	3.5E-01	NSS			2.76E-08
1,1-Dichloroethene	2.00E+00	1	4.55E-02	0.367	4.54E-07	0.88		3.3E-01	3.6E-01	NSS			1.17E-08
1,2-Dichloroethane	3.20E+01	1	1.61E-02	0.377	4.42E-07	0.90		3.1E-01	3.4E-01	NSS			2.33E-08
Benzene	4.30E+01	1	5.10E-02	0.288	5.80E-07	0.69		3.4E-01	3.7E-01	NSS			7.98E-07
Chloroform	1.50E+01	1	2.85E-02	0.488	3.42E-07	1.17		3.2E-01	3.5E-01	NSS			4.53E-08
cis-1,2-Dichloroethene	5.60E+01	1	5.64E-02	0.367	4.54E-07	0.88		3.4E-01	3.7E-01	NSS			1.55E-06
Tetrachloroethene	8.62E-01	1	1.64E-01	0.894	1.86E-07	2.15		4.1E-01	4.5E-01	NSS			3.12E-08
Trichloroethene	3.84E+01	1	5.28E-02	0.569	2.93E-07	1.37		3.4E-01	3.7E-01	NSS			2.00E-07
Vinyl chloride	1.80E+01	1	1.71E-02	0.237	7.03E-07	0.57		3.1E-01	3.4E-01	NSS			7.62E-07

Notes:

(1) Fraction of Absorbed Dose (FA), RAGS Part E 2000 Appendix B, or assumed a default of 1.

(2) Relative Contribution of Permeability Coefficient (B), the ratio of permeability of chemcial in stateum corneum to permeability of chemcial in viable epidermis (dimentionless) calculated using the equation $B = Kp \times \text{squareroot}(MW)/2.6$.

(3) Lag Time - The time after initial contact for chemical to cross stratum corneum. Calculated using equation $\tau = l_{sc}^2 / 6 \times D_{sc}$ where l_{sc} is the thickness of the skin (0.001 cm).

(4) Effective Diffusivity of Chemical Transfer Through Skin (D_{sc}) calculated using the equation $D_{sc} = 10^{-2.8-(0.0056 \times MW)} \times l_{sc}$, where l_{sc} is the thickness of the skin (0.001 cm).

(5) Time to Reach Steady-state (t^*) when $B < \text{or} = 0.6$ calculated using the equation $t^* = 2.4 \times \tau$, when $B > 0.6$, t^* is calculated using the equation $t^* = (b - \text{squareroot}(b^2 - c^2)) \times l_{sc}^2 / D_{sc}$, where l_{sc} is the thickness of the skin (0.001 cm) and other parameters defined above.

(6) t^* when $B > 0.6$, t^* is calculated using the equation $t^* = (b - \text{squareroot}(b^2 - c^2)) \times l_{sc}^2 / D_{sc}$, where l_{sc} is the thickness of the skin (0.001 cm) and other parameters defined above.

(7) The empirical value b is calculated using the equation $b = (2 \times (1+B)^2 / \pi) - c$

(8) The empirical value c is calculated using the equation $c = (1 + 3B + 3B^2) / (3 \times (1 + B))$

(9) Equation used to Calculate DA; SS steadystate, NSS non-steady state, Inorganic or Other for chemcials that are outside the effective predictive domain.

(10) Dose Absorbed per Unit Area per Water Contact Event

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Table B-60
Calculation of Potential Risks and Hazard Indices
Residential (Adult) (RME)
Ground water AOC 4: Dermal (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Receptor:	Resident-Adult
Medium:	Ground water
Exposure Area:	AOC-4
Depth:	All depths
Duration:	Chronic

Dermal Risk Calculations

Noncancer

Within predicted domain;

$$ADD_{der} = \frac{DA \times SA \times EF_{event} \times EF \times EP}{AP \times BW}$$

Outside predicted domain;

$$ADD_{der} = C_{gw} \times DWEF \times DM$$

$$HI_{der} = \frac{ADD_{der\text{-}nc}}{RfD_{der}}$$

Cancer

Within predicted domain;

$$LDI = \frac{DA \times SA \times EF_{event} \times EF \times EP}{AP \times BW}$$

Outside predicted domain;

$$LDI = C_{gw} \times DWEF \times DM$$

$$Risk_{der} = LDI_{der} \times CSF_{der}$$

Parameter	Definition	Units	Value - noncancer	Value - cancer
ADD_{der}	Average daily dose dermal	mg/kg-day		
LDI_{der}	Lifetime daily intake	mg/kg-day		
DA	Dose absorbed per water contact event	mg/cm^2-event	Chemical specific	Chemical specific
SA	Surface area	cm^2	20000	20000
EF_{event}	Exposure event frequency	events/day	1	1
EF	Exposure frequency	days/year	350	350
EP	Exposure period	years	24	24
BW	Body weight	kg	71.8	71.8
DWEF[1]	Drinking water exposure factor		--	9.83E-06
AP	Averaging period	days	2190	27375

Compound	C_{gw} (mg/m^3)	DM (unitless)	DA (mg/cm^2-event)	ADD_{der} (mg/kg-day)	RfD_{der} (mg/kg-day)	HI_{der}	LDI_{der} (mg/kg-day)	CSF_{der} $(mg/kg\text{-}day)^{-1}$	$Risk_{der}$
	Concentration$_{gw}$	Dermal Multiplier for Chemicals Outside Effective Predictive Domain	Dose Absorbed per Unit Area per Water Contact Event	Average daily dose dermal	Dermal Chronic Reference Dose (mg/kg-day)	Hazard Quotient	Lifetime Daily Intake	Dermal Cancer Slope Factor	Cancer Risk
Arsenic	7.30E+00		2.82E-09	3.01E-06	3.00E-04	1E-02	2.41E-07	1.50E+00	4.E-07
bis(2-Chloroethyl)ether	4.80E+02		2.27E-05	2.43E-02	--	NC	1.94E-03	1.10E+00	2.E-03
1,1,2,2-Tetrachloroethane	1.00E+01		7.93E-08	8.48E-05	6.00E-02	1E-03	6.78E-06	2.00E-01	1.E-06
1,1,2-Trichloroethane	2.44E+00		2.76E-08	2.95E-05	4.00E-03	7E-03	2.36E-06	5.70E-02	1.E-07
1,1-Dichloroethene	2.00E+00		1.17E-08	1.25E-05	5.00E-02	2E-04	9.99E-07	--	NC
1,2-Dichloroethane	3.20E+01		2.33E-08	2.49E-05	2.00E-02	1E-03	1.99E-06	9.10E-02	2.E-07
Benzene	4.30E+01		7.98E-07	8.53E-04	4.00E-03	2E-01	6.82E-05	5.50E-02	4.E-06
Chloroform	1.50E+01		4.53E-08	4.84E-05	1.00E-02	5E-03	3.87E-06	--	NC
cis-1,2-Dichloroethene	5.60E+01		1.55E-06	1.66E-03	1.00E-02	2E-01	1.33E-04	--	NC
Tetrachloroethene	8.62E-01		3.12E-08	3.34E-05	1.00E-02	3E-03	2.67E-06	5.40E-01	1.E-06
Trichloroethene	3.84E+01		2.00E-07	2.14E-04	3.00E-04	7E-01	1.71E-05	4.00E-01	7.E-06
Vinyl chloride	1.80E+01		7.62E-07	8.15E-04	3.00E-03	3E-01	6.52E-05	1.40E+00	9.E-05
Total					Hazard	1.E+00		Risk	2.E-03

(1) DWEF Drinking Water Exposure Factor (L-mg)/(kg-ug-d) is the sum of age specific exposures calculated as (IR x EF x EP x Conversion factors of 0.001 mg/ug and 0.002739 years/day) / (BW x AP), using BW of 71.8 kg, intake rate of 2.3 L/day, and EP of 24 years.

Table B-61
Calculation of Potential Exposure
Residential (Child) (RME)
Ground water AOC 4: Dermal (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Dermal Exposure Equations

Non-steady state ($t_{event} < t^*$)	$DA = 2 \times FA \times K_P \times C_{gw} \times CF \times (\text{Squareroot}((6 \times \tau \times t_{event})/\pi))$
Steady state ($t_{event} < t^*$)	$DA = FA \times K_P \times C_{gw} \times CF \times ((t_{event}/(1+B))+2 \times \tau \times ((1+3 \times B+ (3 \times B^2)/(1+B)^2))$
Inorganic chemical	$DA = C_{gw} \times Kp \times CF \times t_{event}$

Parameter	Definition	Units	Value	Source / Comment
DA	Dose absorbed per unit area per water contact event	mg/cm^2-event	chemical specific calculated below	
FA	Fraction of absorbed water	unitless	chemical specific	obtained from RAGS Part E appendix B
C_{gw}	Concentration in groundwater water	ug/L (i.e. mg/m^3)	chemical specific	
t_{event}	Duration of exposure	hour/event	0.53	
K_P	Dermal permeability coefficient	cm/hr	chemical specific	
τ	Lag time	hr/event	chemical specific calculated below	
π	Ratio of the circumference of a circle to its diameter	unitless	3.14	
B	Relative contribution of permeability coefficient	unitless	chemical specific calculated below	
t^*	Time to reach steady-state	hour	chemical specific calculated below	
CF	Conversion factor	m^3/cm^3	0.000001	

Compound	EPC Maximum of Means C_{gw} mg/m^3	Fraction of Absorbed Dose (1) FA unitless	Relative Contribution of Permeability Coefficient (2) B unitless	Lag Time (3) τ hours/event	Effective Diffusivity of Chemical Transfer Through Skin (4) Dsc cm^2/hr	Time to Reach Steady-state (5) t^* hours	t^* when B>0.6 (6)	b (7)	c (8)	Equation used to Calculate DA (9) DA	Dose Absorbed per Unit Area per Water Contact Event (10) DA_{event} mg/cm^2-event
Arsenic	7.30E+00	1	6.43E-03	0.277	6.03E-07	0.66		3.1E-01	3.4E-01	Inorganic	7.51E-09
bis(2-Chloroethyl)ether	4.80E+02	1	8.28E-03	0.665	2.51E-07	1.60		3.1E-01	3.4E-01	NSS	3.71E-05
1,1,2,2-Tetrachloroethane	1.00E+01	1	3.44E-02	0.918	1.82E-07	2.20		3.2E-01	3.6E-01	NSS	1.30E-07
1,1,2-Trichloroethane	2.44E+00	1	2.85E-02	0.584	2.85E-07	1.40		3.2E-01	3.5E-01	NSS	4.51E-08
1,1-Dichloroethene	2.00E+00	1	4.55E-02	0.367	4.54E-07	0.88		3.3E-01	3.6E-01	NSS	1.91E-08
1,2-Dichloroethane	3.20E+01	1	1.61E-02	0.377	4.42E-07	0.90		3.1E-01	3.4E-01	NSS	3.81E-08
Benzene	4.30E+01	1	5.10E-02	0.288	5.80E-07	0.69		3.4E-01	3.7E-01	NSS	1.30E-06
Chloroform	1.50E+01	1	2.85E-02	0.488	3.42E-07	1.17		3.2E-01	3.5E-01	NSS	7.40E-08
cis-1,2-Dichloroethene	5.60E+01	1	5.64E-02	0.367	4.54E-07	0.88		3.4E-01	3.7E-01	NSS	2.53E-06
Tetrachloroethene	8.62E-01	1	1.64E-01	0.894	1.86E-07	2.15		4.1E-01	4.5E-01	NSS	5.10E-08
Trichloroethene	3.84E+01	1	5.28E-02	0.569	2.93E-07	1.37		3.4E-01	3.7E-01	NSS	3.27E-07
Vinyl chloride	1.80E+01	1	1.71E-02	0.237	7.03E-07	0.57		3.1E-01	3.4E-01	NSS	1.25E-06

Notes:

(1) Fraction of Absorbed Dose (FA), RAGS Part E 2000 Appendix B, or assumed a default of 1.

(2) Relative Contribution of Permeability Coefficient (B), the ratio of permeability of chemcial in stateum corneum to permeability of chemcial in viable epidermis (dimentionless) calculated using the equation B = Kp x squareroot(MW)/2.6.

(3) Lag Time - The time after initial contact for chemical to cross stratum corneum. Calculated using equation $\tau = l_{sc}^2/6 \times D_{sc}$ where l_{sc} is the thickness of the skin (0.001 cm).

(4) Effective Diffusivity of Chemical Transfer Through Skin (D_{sc}) calculated using the equation $D_{sc} = 10^{-2.8+(0.0056 \times MW)} \times l_{sc}$ where l_{sc} is the thickness of the skin (0.001 cm).

(5) Time to Reach Steady-state (t^*) when B < or = 0.6 calculated using the equation $t^* = 2.4 \times \tau$, when B > 0.6, t^* is calculated using the equation $t^* = (b - \text{squareroot}(b^2-c^2)) \times l_{sc}^2/D_{sc}$ where l_{sc} is the thickness of the skin (0.001 cm) and other parameters defined above.

(6) t^* when B > 0.6, t^* is calculated using the equation $t^* \doteq (b - \text{squareroot}(b^2-c^2)) \times l_{sc}^2/D_{sc}$, where l_{sc} is the thickness of the skin (0.001 cm) and other parameters defined above.

(7) The empirical value b is calculated using the equation $b = (2 \times (1+B)^2 / \pi) - c$

(8) The empirical value c is calculated using the equation $c = (1+ 3B + 3B^2) / (3 \times (1 + B)$

(9) Equation used to Calculate DA; SS steadystate, NSS non-steady state, Inorganic or Other for chemcials that are outside the effective predictive domain.

(10) Dose Absorbed per Unit Area per Water Contact Event

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Table B-62
Calculation of Potential Risks and Hazard Indices
Residential (Child) (RME)
Ground water AOC 4: Dermal (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Receptor:	Resident-Child
Medium:	Ground water
Exposure Area:	AOC-4
Depth:	All depths
Duration:	Chronic

Dermal Risk Calculations

Noncancer

Within predicted domain;

$$ADD_{der\text{-}nc} = \frac{DA \times SA \times EF_{event} \times EF \times EP}{AP \times BW}$$

Outside predicted domain;

$$ADD_{der} = C_{gw} \times DWEF \times DM$$

$$HI_{der} = \frac{ADD_{der\text{-}nc}}{RfD_{der}}$$

Cancer

Within predicted domain;

$$LDI = DA \times DWDF$$

Outside predicted domain;

$$LDI = C_{gw} \times DWEF \times DM$$

$$Risk_{der} = LDI_{der} \times CSF_{der}$$

Parameter	Definition	Units	Value - noncancer	Value - cancer
ADD_{der}	Average daily dose dermal	mg/kg-day		
LDI_{der}	Lifetime daily intake	mg/kg-day		
DA	Dose absorbed per unit area per water contact event	mg/cm^2-event	Chemical specific	Chemical specific
SA	Surface area	cm^2	6880	6880
EF_{event}	Exposure event frequency	events/day	1	1
EF	Exposure frequency	days/year	350	350
EP	Exposure period	years	6	75
BW	Body weight	kg	14.3	14.3
DWEF[1]	Drinking water exposure factor	L-mg/kg-ug-d	6.71E-05	6.71E-05
DWDF[2]	Drinking water dermal factor	(cm2*event)/(kg*day)	-	461
AP	Averaging time	days	2190	27375

Compound	$Concentration_{gw}$ (C_{gw}) (mg/m^3)	Dermal Multiplier for Chemicals Outside Effective Predictive Domain DM (unitless)	Dose Absorbed per Unit Area per Water Contact Event DA (mg/cm^2-event)	Average daily dose dermal ADD_{der} (mg/kg-day)	Dermal Chronic Reference Dose RfD_{der} (mg/kg-day)	Hazard Quotient HI_{der}	Lifetime Daily Intake LDI_{der} (mg/kg-day)	Dermal Cancer Slope Factor CSF_{der} $(mg/kg\text{-}day)^{-1}$	Cancer Risk $Risk_{der}$
Arsenic	7.30E+00		7.51E-09	3.47E-06	3.00E-04	1E-02	3.47E-06	1.50E+00	5.E-06
bis(2-Chloroethyl)ether	4.80E+02		3.71E-05	1.71E-02	--	NC	1.71E-02	1.10E+00	2.E-02
1,1,2,2-Tetrachloroethane	1.00E+01		1.30E-07	5.98E-05	6.00E-02	1E-03	5.98E-05	2.00E-01	1.E-05
1,1,2-Trichloroethane	2.44E+00		4.51E-08	2.08E-05	4.00E-03	5E-03	2.08E-05	5.70E-02	1.E-06
1,1-Dichloroethene	2.00E+00		1.91E-08	8.80E-06	5.00E-02	2E-04	8.80E-06	--	NC
1,2-Dichloroethane	3.20E+01		3.81E-08	1.76E-05	2.00E-02	9E-04	1.76E-05	9.10E-02	2.E-06
Benzene	4.30E+01		1.30E-06	6.01E-04	4.00E-03	2E-01	6.01E-04	5.50E-02	3.E-05
Chloroform	1.50E+01		7.40E-08	3.41E-05	1.00E-02	3E-03	3.41E-05	--	NC
cis-1,2-Dichloroethene	5.60E+01		2.53E-06	1.17E-03	1.00E-02	1E-01	1.17E-03	--	NC
Tetrachloroethene	8.62E-01		5.10E-08	2.35E-05	1.00E-02	2E-03	2.35E-05	5.40E-01	1.E-05
Trichloroethene	3.84E+01		3.27E-07	1.51E-04	3.00E-04	5E-01	1.51E-04	4.00E-01	6.E-05
Vinyl chloride	1.80E+01		1.25E-06	5.74E-04	3.00E-03	2E-01	5.74E-04	1.40E+00	8.E-04
Total					**Hazard**	**1.E+00**		**Risk**	**2.E-02**

(1) *DWDF Drinking Water Exposure Factor (L-mg)/(kg-ug-d) is the sum of age specific exposures calculated as (IR x EF x EP x Conversion factors of 0.001 mg/ug and 0.002739 years/day) / (BW x AP),* for ages ranges 1-5, 6-15 and 16-29 years using BWs of 14.3, 34.1 and 57.61 kg, Intake rates of 1.5, 2.3, and 2.3 L/day, and EPs of 6, 10 and 14 years, respectively.

(2) DWDF Drinking Water Dermal Factor (cm^2-event)/(kg-day) is the sum of age specific exposures calculated as (SA x EF x EP x Conversion factor of 0.002739 years/day) / (BW x AP), for ages ranges 1-5, 6-15 and 16-29 years using BWs of 14.3, 34.1 and 57.61 kg, Intake rates of 1.5, 2.3, and 2.3 L/day, and EPs of 6, 10 and 14 years, respectively.

Table B-63
Calculation of Potential Exposure
Residential (Child) (RME)
Ground water AOC 4: Inhalation (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Inhalation Exposure Factor Equation

$$EXP_{inh} = \frac{S / R_{ae} \times (D_s + e^{(-R_{ae}D_t)/R_{ae}} - e^{R_{ae}(D_s-D_t)/R_{ae}}) \times n \times EF_1 \times EF_2 \times EP \times C_3}{AP}$$

Parameter	Definition	Units	Value	Comment
EXPinh	Inhalation Exposure Factor	ug/m3	chemcial specific	
S	Indoor air generation rate	ug/(m3-minute)	chemcial specific	
Rae	Air exchange rate	1/minute	8.33E-03	
Ds	Shower duration	minutes	12	
Dt	Total time in shower room	minutes	20	
n	Number of showers per day	day^{-1}	1	
EF1	Exposure frequency	days/week	7	
EF2	Exposure frequency	weeks/year	50	
EPn	Exposure Period - noncancer	years	6	
EPc	Exposure Period - cancer	years	6	
C3	Conversion Factor	years/minute	1.91E-06	
APn	Averaging Period - noncancer	years	6	
APc	Averaging Period - cancer	years	75	

Compound	Concentration in Groundwater	Henry's Law Constant [1]	Molecular Weight	Gas-film mass transfer coefficient[2]	Liquid-film Mass Transfer Coefficient[3]	Overall Mass Transfer Coefficient[4]	Adjusted Mass Transfer Coefficient[5]	Concentration Leaving Water Droplet[6]	Indoor Air Generation Rate [7]	Exposure Factor Noncancer	Exposure Factor Cancer
	C_{gw} ug/L	H atm-m^3/mol	MW g/mole	k_t cm/hr	k_g cm/hr	K_L cm/hr	Ka_L cm/hr	Cwd µg/l	S µg/(m^3-min)	EXPinh-nc µg/m^3	EXPinh-c µg/m^3
Arsenic	7.30E+00	NA	75	1469.69	15.32	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	4.80E+02	1.80E-05	143	1064.36	11.09	7.42E-01	1.00E+00	1.58E+01	2.63E+01	2.78E+00	2.22E-01
1,1,2,2-Tetrachloroethane	1.00E+01	3.44E-04	168	981.98	10.24	5.92E+00	8.00E+00	2.34E+00	3.90E+00	4.12E-01	3.30E-02
1,1,2-Trichloroethane	2.44E+00	9.11E-04	133	1103.65	11.50	9.02E+00	1.22E+01	8.14E-01	1.36E+00	1.43E-01	1.15E-02
1,1-Dichloroethene	2.00E+00	2.60E-02	97	1292.32	13.47	1.33E+01	1.80E+01	9.03E-01	1.51E+00	1.59E-01	1.27E-02
1,2-Dichloroethane	3.20E+01	9.77E-04	99	1279.20	13.33	1.06E+01	1.43E+01	1.22E+01	2.03E+01	2.14E+00	1.71E-01
Benzene	4.30E+01	5.54E-03	78	1441.15	15.02	1.44E+01	1.94E+01	2.05E+01	3.41E+01	3.61E+00	2.89E-01
Chloroform	1.50E+01	3.66E-03	119	1166.77	12.16	1.14E+01	1.54E+01	6.02E+00	1.00E+01	1.06E+00	8.47E-02
cis-1,2-Dichloroethene	5.60E+01	4.07E-03	97	1292.32	13.47	1.27E+01	1.71E+01	2.44E+01	4.06E+01	4.29E+00	3.43E-01
Tetrachloroethene	8.62E-01	1.84E-02	166	987.88	10.30	1.02E+01	1.37E+01	3.17E-01	5.28E-01	5.57E-02	4.46E-03
Trichloroethene	3.84E+01	1.03E-02	131	1112.04	11.59	1.13E+01	1.53E+01	1.53E+01	2.55E+01	2.70E+00	2.16E-01
Vinyl chloride	1.80E+01	2.69E-02	63	1603.57	16.71	1.66E+01	2.24E+01	9.46E+00	1.58E+01	1.67E+00	1.33E-01

Notes:

(1) Henry's Law Constant (obtained from J&E inputs file)

(2) Gas-film mass transfer coefficient calculated using the equation $k_g = k_g(H2O)$ x squareroot (MW H_2O/ MW contaminant), where $k_g(H_2O)$ is 3000 cm/hour, and the MW of H_2O is 18 g/mol.

(3) Liquid-film Mass Transfer Coefficient calculated using the equation $k_l = k_l(CO_2)$ x squareroot (MW CO_2/ MW contaminant), where $k_l(CO_2)$ is 20 cm/hour, and the MW of CO_2 is 44 g/mol.

(4) Overall Mass Transfer Coefficient is calculated using the equation $K_L = (1/k_l + (R \times T / H \times k_g)^{-1})$, where k_l is the liquid film mass tranfer coefficient, R is the universal gas constant (8.2e-5 atm-m^3/mol-K), T is the air temperature (293°K) , H is the Henry's law constant, and k_g is the gas-film mass transfer coefficient.

(5) Adjusted Mass Transfer Coefficient calculated using the equation $K_{aL} = K_L$ x Squareroot $((T_l \times u_s)/(T_s \times u_l))$ where KL= the overall mass transer coefficient, T_l is the calibration temperature of water (293°K), u_s is the viscosity of water at T_s (0.596 cp) and T_s is the shower water temperature (318°K) and u_l is the water viscosity at T_l (1.002 cp)

(6) Concentration Leaving Water Droplet calculated using the equation $C_{wd} = C_w(1-e^{(-K_{aL} \times t_s/60d)})$ where C_w is the shower water concentration, KaL is the adjusted mass transfer coefficient, t_s is the shower droplet time (2 seconds) and 60d is the specific interfacial area 6/d for a spherical droplet of diameter d (mm), multiplied by conversion factors hr/3600 sec and 10 mm/cm.

(7) Indoor Air Generation Rate (S) calculated using the equation $S = C_{wd}$ x FR / SV, where C_{wd} is the concentration leaving the water droplet, FR is the shower flow rate (10 L/minute) and SV is the shower room volume (6 m^3)

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Table B-64
Calculation of Potential Risks and Hazard Indices
Residential (Child) (RME)
Ground water AOC 4: Inhalation (showering)
BROS Human Health Risk Assessment
Bridgeport, NJ

Inhalation Risk Calculations

$$HI_{inh} = \frac{EXP_{inh\text{-}nc}}{RfC \times CF}$$

$$Risk_{inh} = EXP_{inh\text{-}c} \times UR_i$$

Receptor:	Resident-Child
Medium:	Ground water
Exposure Area:	AOC-4
Depth:	All depths
Duration:	Chronic

Parameter	Definition	Units	Value
$EXP_{inh\text{-}nc}$	Exposure Factor noncancer	µg/m3	Chemical specific
$EXP_{inh\text{-}c}$	Exposure Factor cancer	µg/m3	Chemical specific
CF	Conversion Factor	ug/mg	1000

Compound	EPC C_{gw} ug/l	Exposure Factor Noncancer $EXP_{inh\text{-}nc}$ µg/m^3	RfC (mg/m^3)	Hazard Index	Exposure factor Cancer Risk $EXP_{inh\text{-}c}$ µg/m3	Inhalation Unit Risk (ug/m3)-1	Cancer Risk
Arsenic	7.30E+00	NA	1.05E-03	NC	NA	--	NC
bis(2-Chloroethyl)ether	4.80E+02	2.78E+00	--	NC	2.22E-01	3.30E-04	7.33E-05
1,1,2,2-Tetrachloroethane	1.00E+01	4.12E-01	2.10E-01	1.96E-03	3.30E-02	5.80E-05	1.91E-06
1,1,2-Trichloroethane	2.44E+00	1.43E-01	1.40E-02	1.02E-02	1.15E-02	1.60E-05	1.83E-07
1,1-Dichloroethene	2.00E+00	1.59E-01	2.10E-01	7.57E-04	1.27E-02	--	NC
1,2-Dichloroethane	3.20E+01	2.14E+00	4.90E-03	4.37E-01	1.71E-01	2.60E-05	4.45E-06
Benzene	4.30E+01	3.61E+00	3.01E-02	1.20E-01	2.89E-01	7.80E-06	2.25E-06
Chloroform	1.50E+01	1.06E+00	4.90E-02	2.16E-02	8.47E-02	2.30E-05	1.95E-06
cis-1,2-Dichloroethene	5.60E+01	4.29E+00	3.50E-02	1.23E-01	3.43E-01	--	NC
Tetrachloroethene	8.62E-01	5.57E-02	4.90E-01	1.14E-04	4.46E-03	3.00E-06	1.34E-08
Trichloroethene	3.84E+01	2.70E+00	3.50E-02	7.70E-02	2.16E-01	1.10E-04	2.37E-05
Vinyl chloride	1.80E+01	1.67E+00	9.80E-02	1.70E-02	1.33E-01	8.80E-06	1.17E-06
Total			**Hazard**	8.08E-01		**Risk**	1.09E-04

Table B-65
Calculation of Potential Risks and Hazard indices
Agricultural (Adult) (RME)
Ground water AOC-1b: Inhalation: Vol from Irrigation
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value	
ADD: Average Daily Dose (mg/kg-d)	See Below	
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific	
CA: Chemical Concentration in Air (mg/m3)	Chemical-Specific	
BW: Body Weight (kg)	71.8	
InhR: Inhalation Rate (m3/hr)	1.5	
Qw: water flow rate (l/s)	9.46	
L = box length (m)	60	200-foot radius around nozzle
w = box width (m)	3.5	Height above corn crops
u = wind speed (m/s)	2.25	USEPA RAGS B
ET: Exposure Time (hr/day)	1	
EF: Exposure Frequency (days/year)	72	
ED: Exposure Duration (years)	30	
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	10950	
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375	
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific	
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific	

$$ADD\ (mg/kg\text{-}d) = \frac{CA \times InhR \times ET \times EF \times ED}{BW \times AT}$$

$$CA = \frac{CW \times QW}{L \times W \times U}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-1b Ground water (mg/L)	Air (mg/m3)	Noncancer Hazard Quotient ADD (mg/kg-day)	RfDi (mg/kg-d)	Air HQ	Excess Lifetime Cancer Risk ADD (mg/kg-day)	CSFi 1/(mg/kg-day)]	Air Risk
Aluminum	7429-90-5	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Arsenic	7440-38-2	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Barium	7440-39-3	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Beryllium	7440-41-7	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Chromium	7440-47-3	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Cobalt	7440-48-4	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Copper	7440-50-8	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Lead	7439-92-1	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Mercury	7439-97-6	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Nickel	7440-02-0	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Selenium	7782-49-2	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Thallium	7440-28-0	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Vanadium	7440-62-2	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Zinc	7440-66-6	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
2,4-Dimethylphenol	105-67-9	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
2-Methylnapthalene	91-57-6	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
3-Nitroaniline	99-09-2	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
4-Chloro-3-methylphenol	59-50-7	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
4-Chloroaniline	106-47-8	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
4-Methyl-2-pentanone	108-10-1	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Acenaphthylene	208-96-8	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Benzo(a)anthracene	56-55-3	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Benzo(a)pyrene	50-32-8	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Benzo(b)fluoranthene	205-99-2	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Benzo(g,h,i)perylene	191-24-2	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
bis(2-Chloroethyl)ether	111-44-4	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
bis(2-Ethylhexyl)phthalate	117-81-7	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Dibenzofuran	132-64-9	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Indeno(1,2,3-cd)pyrene	193-39-5	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Isophorone	78-59-1	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Naphthalene	91-20-3	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Nitrobenzene	98-95-3	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Phenanthrene	85-01-8	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
						NA			NA

Notes:
NC: Risk not calculated. No toxicity value.
Not VOC: Irrigation scenario only evaluated for VOC compounds

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Table B-66
Calculation of Potential Risks and Hazard indices
Agricultural (Child) (RME)
Ground water AOC-1b: Inhalation: Vol from Irrigation
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value	
ADD: Average Daily Dose (mg/kg-d)	See Below	
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific	
CA: Chemical Concentration in Air (mg/m3)	Chemical-Specific	
BW: Body Weight (kg)	16.6	
InhR: Inhalation Rate (m3/hr)	1.2	
Qw: water flow rate (l/s)	9.46	
L = box length (m)	60	200-foot radius around nozzle
w = box width (m)	3.5	Height above corn crops
u = wind speed (m/s)	2.25	USEPA RAGS B
ET: Exposure Time (hr/day)	1	
EF: Exposure Frequency (days/year)	72	
ED: Exposure Duration (years)	6	
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190	
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375	
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific	
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific	

$$ADD\ (mg/kg\text{-}d) = \frac{CA \times InhR \times ET \times EF \times ED}{BW \times AT}$$

$$CA = \frac{CW \times QW}{L \times W \times U}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-1b Ground water (mg/L)	Air (mg/m3)	Noncancer Hazard Quotient ADD (mg/kg-day)	RfDi (mg/kg-d)	Air HQ	Excess Lifetime Cancer Risk ADD (mg/kg-day)	CSFi 1/(mg/kg-day)]	Air Risk
Aluminum	7429-90-5	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Arsenic	7440-38-2	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Barium	7440-39-3	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Beryllium	7440-41-7	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Chromium	7440-47-3	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Cobalt	7440-48-4	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Copper	7440-50-8	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Lead	7439-92-1	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Mercury	7439-97-6	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Nickel	7440-02-0	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Selenium	7782-49-2	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Thallium	7440-28-0	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Vanadium	7440-62-2	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Zinc	7440-66-6	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
2,4-Dimethylphenol	105-67-9	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
2-Methylnapthalene	91-57-6	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
3-Nitroaniline	99-09-2	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
4-Chloro-3-methylphenol	59-50-7	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
4-Chloroaniline	106-47-8	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
4-Methyl-2-pentanone	108-10-1	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Acenaphthylene	208-96-8	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Benzo(a)anthracene	56-55-3	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Benzo(a)pyrene	50-32-8	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Benzo(b)fluoranthene	205-99-2	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Benzo(g,h,i)perylene	191-24-2	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
bis(2-Chloroethyl)ether	111-44-4	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
bis(2-Ethylhexyl)phthalate	117-81-7	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Dibenzofuran	132-64-9	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Indeno(1,2,3-cd)pyrene	193-39-5	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Isophorone	78-59-1	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Naphthalene	91-20-3	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Nitrobenzene	98-95-3	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
Phenanthrene	85-01-8	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC	Not VOC
						NA			NA

Notes:
NC: Risk not calculated. No toxicity value.
Not VOC: Irrigation scenario only evaluated for VOC compounds

800402

Table B-67a
Calculation of Potential Risks and Hazard indices
Agricultural (Adult) (RME)
Ground water AOC-4: Inhalation: Vol from Irrigation
BROS Human Health Risk Assessment

Parameter (units)	Value	
ADD: Average Daily Dose (mg/kg-d)	See Below	
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific	
CA: Chemical Concentration in Air (mg/m3)	Chemical-Specific	
BW: Body Weight (kg)	71.8	
InhR: Inhalation Rate (m3/hr)	1.5	
Qw: water flow rate (l/s)	9.46	
L = box length (m)	60	200-foot radius around nozzle
w = box width (m)	3.5	Height above corn crops
u = wind speed (m/s)	2.25	USEPA RAGS B
ET: Exposure Time (hr/day)	1	
EF: Exposure Frequency (days/year)	72	
ED: Exposure Duration (years)	30	
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	10950	
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375	
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific	
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific	

$$\text{ADD (mg/kg-d)} = \frac{\text{CA x InhR x ET x EF x ED}}{\text{BW x AT}}$$

$$\text{CA} = \frac{\text{CW x QW}}{\text{L X W X U}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-4 Ground water (mg/L)	Air (mg/m3)	Noncancer Hazard Quotient ADD (mg/kg-day)	RfDi (mg/kg-d)	Air HQ	Excess Lifetime Cancer Risk ADD (mg/kg-day)	CSFi 1/(mg/kg-day)]	Air Risk
1,1,2,2-Tetrachloroethane	79-34-5	0.01	2.00E-04	8.25E-07	6.00E-02	1.4E-05	3.30E-07	2.00E-01	6.6E-08
1,1,2-Trichloroethane	79-00-5	0.002	4.88E-05	2.01E-07	4.00E-03	5.0E-05	8.05E-08	5.60E-02	4.5E-09
1,1-Dichloroethene	75-35-4	0.002	4.00E-05	1.65E-07	6.00E-02	2.8E-06	6.60E-08	--	NC
1,2-Dichloroethane	107-06-2	0.032	6.41E-04	2.64E-06	1.40E-03	1.9E-03	1.06E-06	9.10E-02	9.6E-08
Benzene	71-43-2	0.043	8.61E-04	3.55E-06	8.60E-03	4.1E-04	1.42E-06	2.70E-02	3.8E-08
Chloroform	67-66-3	0.015	3.00E-04	1.24E-06	1.40E-02	8.8E-05	4.95E-07	8.10E-02	4.0E-08
cis-1,2-Dichloroethene	156-59-2	0.056	1.12E-03	4.62E-06	1.00E-02	4.6E-04	1.85E-06	--	NC
Tetrachloroethene	127-18-4	0.001	1.73E-05	7.11E-08	1.40E-01	5.1E-07	2.85E-08	2.00E-02	5.7E-10
Trichloroethene	79-01-6	0.04	7.68E-04	3.16E-06	1.00E-02	3.2E-04	1.27E-06	4.00E-01	5.1E-07
Vinyl chloride	75-01-4a	0.018	3.60E-04	1.49E-06	2.80E-02	5.3E-05	5.94E-07	1.50E-02	8.9E-09
Totals						3.3E-03			7.6E-07

Notes:
NC: Risk not calculated. No toxicity value.
Not VOC: Irrigation scenario only evaluated for VOC compounds

800403

Table B-67b
Calculation of Potential Risks and Hazard indices
Agricultural (Adult) (CTE)
Ground water AOC-4: Inhalation: Vol from Irrigation
BROS Human Health Risk Assessment

Parameter (units)	Value	
ADD: Average Daily Dose (mg/kg-d)	See Below	
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific	
CA: Chemical Concentration in Air (mg/m3)	Chemical-Specific	
BW: Body Weight (kg)	71.8	
InhR: Inhalation Rate (m3/hr)	1.5	
Qw: water flow rate (l/s)	9.46	
L = box length (m)	60	200-foot radius around nozzle
w = box width (m)	3.5	Height above corn crops
u = wind speed (m/s)	2.25	USEPA RAGS B
ET: Exposure Time (hr/day)	1	
EF: Exposure Frequency (days/year)	12	
ED: Exposure Duration (years)	30	
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	10950	
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375	
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific	
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific	

$$\text{ADD (mg/kg-d)} = \frac{\text{CA x InhR x ET x EF x ED}}{\text{BW x AT}}$$

$$\text{CA} = \frac{\text{CW x QW}}{\text{L X W X U}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-4 Groundwater (mg/L)	Air (mg/m3)	Noncancer Hazard Quotient ADD (mg/kg-day)	RfDi (mg/kg-d)	Air HQ	Excess Lifetime Cancer Risk ADD (mg/kg-day)	CSFi 1/(mg/kg-day)]	Air Risk
1,1,2,2-Tetrachloroethane	79-34-5	0.01	2.00E-04	1.38E-07	6.00E-02	2.3E-06	5.50E-08	2.00E-01	1.1E-08
1,1,2-Trichloroethane	79-00-5	0.002	4.88E-05	3.35E-08	4.00E-03	8.4E-06	1.34E-08	5.60E-02	7.5E-10
1,1-Dichloroethene	75-35-4	0.002	4.00E-05	2.75E-08	6.00E-02	4.6E-07	1.10E-08	--	NC
1,2-Dichloroethane	107-06-2	0.032	6.41E-04	4.40E-07	1.40E-03	3.1E-04	1.76E-07	9.10E-02	1.6E-08
Benzene	71-43-2	0.043	8.61E-04	5.91E-07	8.60E-03	6.9E-05	2.37E-07	2.70E-02	6.4E-09
Chloroform	67-66-3	0.015	3.00E-04	2.06E-07	1.40E-02	1.5E-05	8.25E-08	8.10E-02	6.7E-09
cis-1,2-Dichloroethene	156-59-2	0.056	1.12E-03	7.70E-07	1.00E-02	7.7E-05	3.08E-07	--	NC
Tetrachloroethene	127-18-4	0.001	1.73E-05	1.19E-08	1.40E-01	8.5E-08	4.74E-09	2.00E-02	9.5E-11
Trichloroethene	79-01-6	0.04	7.68E-04	5.27E-07	1.00E-02	5.3E-05	2.11E-07	4.00E-01	8.4E-08
Vinyl chloride	75-01-4a	0.018	3.60E-04	2.48E-07	2.80E-02	8.8E-06	9.90E-08	1.50E-02	1.5E-09
Total						5.5E-04			1.3E-07

Notes:
NC: Risk not calculated. No toxicity value.

Table B-68a
Calculation of Potential Risks and Hazard indices
Agricultural (Child) (RME)
Ground water AOC-4: Inhalation: Vol from Irrigation
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value	
ADD: Average Daily Dose (mg/kg-d)	See Below	
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific	
CA: Chemical Concentration in Air (mg/m3)	Chemical-Specific	
BW: Body Weight (kg)	16.6	
InhR: Inhalation Rate (m3/hr)	1.2	
Qw: water flow rate (l/s)	9.46	
L = box length (m)	60	200-foot radius around nozzle
w = box width (m)	3.5	Height above corn crops
u = wind speed (m/s)	2.25	USEPA RAGS B
ET: Exposure Time (hr/day)	1	
EF: Exposure Frequency (days/year)	72	
ED: Exposure Duration (years)	6	
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190	
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375	
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific	
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific	

$$ADD\ (mg/kg\text{-}d) = \frac{CA \times InhR \times ET \times EF \times ED}{BW \times AT}$$

$$CA = \frac{CW \times QW}{L \times W \times U}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-4 Ground water (mg/L)	Air (mg/m3)	Noncancer Hazard Quotient ADD (mg/kg-day)	RfDi (mg/kg-d)	Air HQ	Excess Lifetime Cancer Risk ADD (mg/kg-day)	CSFi 1/(mg/kg-day)]	Air Risk
1,1,2,2-Tetrachloroethane	79-34-5	0.01	2.00E-04	2.85E-06	6.00E-02	4.8E-05	2.28E-07	2.00E-01	4.6E-08
1,1,2-Trichloroethane	79-00-5	0.002	4.88E-05	6.96E-07	4.00E-03	1.7E-04	5.57E-08	5.60E-02	3.1E-09
1,1-Dichloroethene	75-35-4	0.002	4.00E-05	5.71E-07	6.00E-02	9.5E-06	4.57E-08	--	NC
1,2-Dichloroethane	107-06-2	0.032	6.41E-04	9.14E-06	1.40E-03	6.5E-03	7.31E-07	9.10E-02	6.7E-08
Benzene	71-43-2	0.043	8.61E-04	1.23E-05	8.60E-03	1.4E-03	9.82E-07	2.70E-02	2.7E-08
Chloroform	67-66-3	0.015	3.00E-04	4.28E-06	1.40E-02	3.1E-04	3.43E-07	8.10E-02	2.8E-08
cis-1,2-Dichloroethene	156-59-2	0.056	1.12E-03	1.60E-05	1.00E-02	1.6E-03	1.28E-06	--	NC
Tetrachloroethene	127-18-4	0.001	1.73E-05	2.46E-07	1.40E-01	1.8E-06	1.97E-08	2.00E-02	3.9E-10
Trichloroethene	79-01-6	0.038	7.68E-04	1.10E-05	1.00E-02	1.1E-03	8.76E-07	4.00E-01	3.5E-07
Vinyl chloride	75-01-4c	0.018	3.60E-04	5.14E-06	2.80E-02	1.8E-04	4.11E-07	3.00E-02	1.2E-08
Totals						1.1E-02			5.3E-07

Notes:
NC: Risk not calculated. No toxicity value.

800405

Table B-68b
Calculation of Potential Risks and Hazard indices
Agricultural (Young Child) (CTE)
Groundwater AOC-4: Inhalation: Vol from Irrigation
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value	
ADD: Average Daily Dose (mg/kg-d)	See Below	
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific	
CA: Chemical Concentration in Air (mg/m3)	Chemical-Specific	
BW: Body Weight (kg)	16.6	
InhR: Inhalation Rate (m3/hr)	1.2	
Qw: water flow rate (l/s)	9.46	
L = box length (m)	60	200-foot radius around nozzle
w = box width (m)	3.5	Height above corn crops
u = wind speed (m/s)	2.25	USEPA RAGS B
ET: Exposure Time (hr/day)	1	
EF: Exposure Frequency (days/year)	12	
ED: Exposure Duration (years)	6	
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190	
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375	
RfDi: Inhalation Reference Dose (mg/kg-d)	Chemical-Specific	
CSFi: Inhalation Cancer Slope Factor [1/(mg/kg-d)]	Chemical-Specific	

$$\text{ADD (mg/kg-d)} = \frac{\text{CA x InhR x ET x EF x ED}}{\text{BW x AT}}$$

$$\text{CA} = \frac{\text{CW x QW}}{\text{L X W X U}}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfDi (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSFi [1/(mg/kg-day)]

Compound	CASRN	AOC-4 Groundwater (mg/L)	Air (mg/m3)	Noncancer Hazard Quotient ADD (mg/kg-day)	RfDi (mg/kg-d)	Air HQ	Excess Lifetime Cancer Risk ADD (mg/kg-day)	CSFi 1/(mg/kg-day)]	Air Risk
1,1,2,2-Tetrachloroethane	79-34-5	1.00E-02	2.00E-04	4.76E-07	6.00E-02	7.9E-06	3.81E-08	2.00E-01	7.6E-09
1,1,2-Trichloroethane	79-00-5	2.44E-03	4.88E-05	1.16E-07	4.00E-03	2.9E-05	9.28E-09	5.60E-02	5.2E-10
1,1-Dichloroethene	75-35-4	2.00E-03	4.00E-05	9.52E-08	6.00E-02	1.6E-06	7.61E-09	--	NC
1,2-Dichloroethane	107-06-2	3.20E-02	6.41E-04	1.52E-06	1.40E-03	1.1E-03	1.22E-07	9.10E-02	1.1E-08
Benzene	71-43-2	4.30E-02	8.61E-04	2.05E-06	8.60E-03	2.4E-04	1.64E-07	2.70E-02	4.4E-09
Chloroform	67-66-3	1.50E-02	3.00E-04	7.14E-07	1.40E-02	5.1E-05	5.71E-08	8.10E-02	4.6E-09
cis-1,2-Dichloroethene	156-59-2	5.60E-02	1.12E-03	2.66E-06	1.00E-02	2.7E-04	2.13E-07	--	NC
Tetrachloroethene	127-18-4	8.62E-04	1.73E-05	4.10E-08	1.40E-01	2.9E-07	3.28E-09	2.00E-02	6.6E-11
Trichloroethene	79-01-6	3.84E-02	7.68E-04	1.83E-06	1.00E-02	1.8E-04	1.46E-07	4.00E-01	5.8E-08
Vinyl chloride	75-01-4c	1.80E-02	3.60E-04	8.56E-07	2.80E-02	3.1E-05	6.85E-08	3.00E-02	2.1E-09
Totals						1.9E-03			8.9E-08

Notes:
NC: Risk not calculated. No toxicity value.

Table B-69
Calculation of Potential Risks and Hazard indices
Agricultural (Adult) (RME)
Ground water AOC-1b: Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	NA
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	NA
SA: Skin Surface Area (cm2)	1980
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	72
ED: Exposure Duration (years)	30
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	10950
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

ADD-Dermal (mg/kg-day) = $\frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

					Noncancer Hazard Quotient							Excess Lifetime Cancer Risk						
Compound	CASRN	AOC-1b Ground water (mg/L)	Kp (cm/hr)	OA	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Aluminum	7429-90-5	0.855	2.14E-03	0.1	NA	9.95E-06	1.00E+00	1.00E-01	NA	9.95E-05	9.95E-05	NA	3.98E-06	--	--	NA	NC	NC
Thallium	7440-28-0	0.0133	1.57E-04	1	NA	1.14E-08	7.00E-05	7.00E-05	NA	1.62E-04	1.62E-04	NA	4.54E-09	--	--	NA	NC	NC
							Hazard Index:				2.62E-04			Total Cancer Risk:				NA

Notes:
NC: Risk not calculated. No toxicity value.

800407

Table B-70
Calculation of Potential Risks and Hazard Indices
Agricultural (Child) (RME)
Ground water AOC-1b: Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	NA
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	NA
SA: Skin Surface Area (cm2)	7313
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	72
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	16.6
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

ADD-Dermal (mg/kg-day) = $\frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

		AOC-1b			Noncancer Hazard Quotient							Excess Lifetime Cancer Risk						
Compound	CASRN	Ground water (mg/L)	Kp (cm/hr)	OA	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Aluminum	7429-90-5	0.855	2.14E-03	0.1	NA	1.59E-04	1.00E+00	1.00E-01	NA	1.59E-03	1.59E-03	NA	1.27E-05	--	--	NA	NC	NC
Thallium	7440-28-0	0.0133	1.57E-04	1	NA	1.81E-07	7.00E-05	7.00E-05	NA	2.59E-03	2.59E-03	NA	1.45E-08	--	--	NA	NC	NC
							Hazard Index:				4.18E-03			Total Cancer Risk:				NA

Notes:
NC: Risk not calculated. No toxicity value.

800408

Table B-71a
Calculation of Potential Risks and Hazard indices
Agricultural (Adult) (RME)
Ground water AOC-4: Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	NA
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	NA
SA: Skin Surface Area (cm2)	1980
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	72
ED: Exposure Duration (years)	30
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	10950
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-4 Ground water (mg/L)	Kp (cm/hr)	OA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Arsenic	7440-38-2	0.0073	1.93E-03	0.95	NA	7.66E-08	3.00E-04	3.00E-04	NA	2.55E-04	2.55E-04	NA	3.07E-08	1.50E+00	1.50E+00	NA	4.60E-08	4.60E-08
bis(2-Chloroethyl)ether	111-44-4	0.48	1.80E-03	0.5	NA	4.70E-06	--	--	NA	NC	NC	NA	1.88E-06	1.10E+00	1.10E+00	NA	2.07E-06	2.07E-06
1,1,2,2-Tetrachloroethan	79-34-5	0.01	6.90E-03	0.7	NA	3.75E-07	6.00E-02	6.00E-02	NA	6.26E-06	6.26E-06	NA	1.50E-07	2.00E-01	2.00E-01	NA	3.00E-08	3.00E-08
1,1,2-Trichloroethane	79-00-5	0.002	6.43E-03	0.81	NA	8.53E-08	4.00E-03	4.00E-03	NA	2.13E-05	2.13E-05	NA	3.41E-08	5.70E-02	5.70E-02	NA	1.94E-09	1.94E-09
1,1-Dichloroethene	75-35-4	0.002	1.20E-02	1	NA	1.31E-07	5.00E-02	5.00E-02	NA	2.61E-06	2.61E-06	NA	5.22E-08	--	--	NA	NC	NC
1,2-Dichloroethane	107-06-2	0.032	4.20E-03	1	NA	7.31E-07	2.00E-02	2.00E-02	NA	3.66E-05	3.66E-05	NA	2.92E-07	9.10E-02	9.10E-02	NA	2.66E-08	2.66E-08
Benzene	71-43-2	0.043	1.50E-02	0.97	NA	3.51E-06	4.00E-03	4.00E-03	NA	8.77E-04	8.77E-04	NA	1.40E-06	5.50E-02	5.50E-02	NA	7.72E-08	7.72E-08
Chloroform	67-66-3	0.015	6.80E-03	1	NA	5.55E-07	1.00E-02	1.00E-02	NA	5.55E-05	5.55E-05	NA	2.22E-07	--	--	NA	NC	NC
cis-1,2-Dichloroethene	156-59-2	0.056	1.49E-02	1	NA	4.54E-06	1.00E-02	1.00E-02	NA	4.54E-04	4.54E-04	NA	1.82E-06	--	--	NA	NC	NC
Tetrachloroethene	127-18-4	0.001	3.30E-02	1	NA	1.55E-07	1.00E-02	1.00E-02	NA	1.55E-05	1.55E-05	NA	6.19E-08	5.40E-01	5.40E-01	NA	3.34E-08	3.34E-08
Trichloroethene	79-01-6	0.038	1.20E-02	1	NA	2.50E-06	3.00E-04	3.00E-04	NA	8.35E-03	8.35E-03	NA	1.00E-06	4.00E-01	4.00E-01	NA	4.01E-07	4.01E-07
Vinyl chloride	75-01-4a	0.018	5.60E-03	1	NA	5.48E-07	3.00E-03	3.00E-03	NA	1.83E-04	1.83E-04	NA	2.19E-07	7.20E-01	7.20E-01	NA	1.58E-07	1.58E-07
							Hazard Index:				1.03E-02			Total Cancer Risk:				2.84E-06

Notes:
NC: Risk not calculated. No toxicity value.

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Table B-71b
Calculation of Potential Risks and Hazard indices
Agricultural (Adult) (CTE)
Groundwater AOC-4: Dermal Contact
BROS Human Health Risk Assessment

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day	See Below
CW: Chemical Concentration in Water (mg/L	Chemical-Specific
IR: Ingestion Rate (L/day	NA
OA: Oral Absorption Factor (unitless	Chemical-Specific
FR: Fraction Contaminated (unitless	NA
SA: Skin Surface Area (cm2)	1980
Kp - Permeability Constant (cm/hr	Chemical-Specific
RAF: Relative Dermal Absorption Factor (unitless	Chemical-Specific
ET: Exposure Time (hr/day	1
EF: Exposure Frequency (days/year	12
ED: Exposure Duration (years	30
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer	10950
RfD: Reference Dose (mg/kg-day	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$

ADD-Dermal (mg/kg-day) = $\frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)

Compound	CASRN	AOC-4 Groundwater (mg/L)	Kp (cm/hr)	OA	Noncancer Hazard Quotien: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD Adjusted (mg/kg-day)	HQ Ingestion	HQ Dermal	Total HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Risk-Ingestion	Risk-Dermal	Total Risk
Arsenic	7440-38-2	0.0073	0.00193	0.95	NA	1.28E-08	3.00E-04	3.00E-04	NA	4.26E-05	4.26E-05	NA	5.11E-09	1.50E+00	1.50E+00	NA	7.66E-09	7.66E-09
bis(2-Chloroethyl)ether	111-44-4	0.48	0.0018	0.5	NA	7.83E-07	--	--	NA	NC	NC	NA	3.13E-07	1.10E+00	1.10E+00	NA	3.45E-07	3.45E-07
1,1,2,2-Tetrachloroethane	79-34-5	0.01	0.0069	0.7	NA	6.26E-08	6.00E-02	6.00E-02	NA	1.04E-06	1.04E-06	NA	2.50E-08	2.00E-01	2.00E-01	NA	5.00E-09	5.00E-09
1,1,2-Trichloroethane	79-00-5	0.002438139	0.00643	0.81	NA	1.42E-08	4.00E-03	4.00E-03	NA	3.55E-06	3.55E-06	NA	5.69E-09	5.70E-02	5.70E-02	NA	3.24E-10	3.24E-10
1,1-Dichloroethene	75-35-4	0.002	0.012	1	NA	2.18E-08	5.00E-02	5.00E-02	NA	4.35E-07	4.35E-07	NA	8.70E-09	--	--	NA	NC	NC
1,2-Dichloroethane	107-06-2	0.032	0.0042	1	NA	1.22E-07	2.00E-02	2.00E-02	NA	6.09E-06	6.09E-06	NA	4.87E-08	9.10E-02	9.10E-02	NA	4.44E-09	4.44E-09
Benzene	71-43-2	0.043	0.015	0.97	NA	5.85E-07	4.00E-03	4.00E-03	NA	1.46E-04	1.46E-04	NA	2.34E-07	5.50E-02	5.50E-02	NA	1.29E-08	1.29E-08
Chloroform	67-66-3	0.015	0.0068	1	NA	9.25E-08	1.00E-02	1.00E-02	NA	9.25E-06	9.25E-06	NA	3.70E-08	--	--	NA	NC	NC
cis-1,2-Dichloroethene	156-59-2	0.056	0.0149	1	NA	7.56E-07	1.00E-02	1.00E-02	NA	7.56E-05	7.56E-05	NA	3.03E-07	--	--	NA	NC	NC
Tetrachloroethene	127-18-4	0.000862287	0.033	1	NA	2.58E-08	1.00E-02	1.00E-02	NA	2.58E-06	2.58E-06	NA	1.03E-08	5.40E-01	5.40E-01	NA	5.57E-09	5.57E-09
Trichloroethene	79-01-6	0.038359859	0.012	1	NA	4.17E-07	3.00E-04	3.00E-04	NA	1.39E-03	1.39E-03	NA	1.67E-07	4.00E-01	4.00E-01	NA	6.68E-08	6.68E-08
Vinyl chloride	75-01-4a	0.018	0.0056	1	NA	9.14E-08	3.00E-03	3.00E-03	NA	3.05E-05	3.05E-05	NA	3.66E-08	7.20E-01	7.20E-01	NA	2.63E-08	2.63E-08
							Hazard Index				1.71E-03			Total Cancer Risk:				4.74E-07

Notes:
NC: Risk not calculated. No toxicity value.

Table B-72a
Calculation of Potential Risks and Hazard indices
Agricultural (Child) (RME)
Ground water AOC-4: Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	NA
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	NA
SA: Skin Surface Area (cm2)	7313
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	72
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	16.6
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

ADD-Dermal (mg/kg-day) = $\frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-4 Ground water (mg/L)	Kp (cm/hr)	OA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Arsenic	7440-38-2	0.0073	1.93E-03	0.95	NA	1.22E-06	3.00E-04	3.00E-04	NA	4.08E-03	3.00E-04	NA	9.79E-08	1.50E+00	1.50E+00	NA	1.47E-07	1.47E-07
bis(2-Chloroethyl)ether	111-44-4	0.48	1.80E-03	0.5	NA	7.51E-05	--	--	NA	NC	NC	NA	6.01E-06	1.10E+00	1.10E+00	NA	6.61E-06	6.61E-06
1,1,2,2-Tetrachloroethane	79-34-5	0.01	6.90E-03	0.7	NA	6.00E-06	6.00E-02	6.00E-02	NA	9.99E-05	6.00E-02	NA	4.80E-07	2.00E-01	2.00E-01	NA	9.59E-08	9.59E-08
1,1,2-Trichloroethane	79-00-5	0.002	6.43E-03	0.81	NA	1.36E-06	4.00E-03	4.00E-03	NA	3.41E-04	4.00E-03	NA	1.09E-07	5.70E-02	5.70E-02	NA	6.21E-09	6.21E-09
1,1-Dichloroethene	75-35-4	0.002	1.20E-02	1	NA	2.09E-06	5.00E-02	5.00E-02	NA	4.17E-05	5.00E-02	NA	1.67E-07	--	--	NA	NC	NC
1,2-Dichloroethane	107-06-2	0.032	4.20E-03	1	NA	1.17E-05	2.00E-02	2.00E-02	NA	5.84E-04	2.00E-02	NA	9.34E-07	9.10E-02	9.10E-02	NA	8.50E-08	8.50E-08
Benzene	71-43-2	0.043	1.50E-02	0.97	NA	5.61E-05	4.00E-03	4.00E-03	NA	1.40E-02	4.00E-03	NA	4.48E-06	5.50E-02	5.50E-02	NA	2.47E-07	2.47E-07
Chloroform	67-66-3	0.015	6.80E-03	1	NA	8.86E-06	1.00E-02	1.00E-02	NA	8.86E-04	1.00E-02	NA	7.09E-07	--	--	NA	NC	NC
cis-1,2-Dichloroethene	156-59-2	0.056	1.49E-02	1	NA	7.25E-05	1.00E-02	1.00E-02	NA	7.25E-03	1.00E-02	NA	5.80E-06	--	--	NA	NC	NC
Tetrachloroethene	127-18-4	0.001	3.30E-02	1	NA	2.47E-06	1.00E-02	1.00E-02	NA	2.47E-04	1.00E-02	NA	1.98E-07	5.40E-01	5.40E-01	NA	1.07E-07	1.07E-07
Trichloroethene	79-01-6	0.038	1.20E-02	1	NA	4.00E-05	3.00E-04	3.00E-04	NA	1.33E-01	3.00E-04	NA	3.20E-06	4.00E-01	4.00E-01	NA	1.28E-06	1.28E-06
Vinyl chloride	75-01-4c	0.018	5.60E-03	1	NA	8.76E-06	3.00E-03	3.00E-03	NA	2.92E-03	3.00E-03	NA	7.01E-07	1.40E+00	1.40E+00	NA	9.81E-07	9.81E-07
							Hazard Index:				1.72E-01			Total Cancer Risk:				9.56E-06

Notes:
NC: Risk not calculated. No toxicity value.

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Table B-72b
Calculation of Potential Risks and Hazard indices
Agricultural (Child) (CTE)
Ground water AOC-4: Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	NA
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	NA
SA: Skin Surface Area (cm2)	7313
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	12
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	16.6
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

ADD-Dermal (mg/kg-day) = $\frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-4 Ground water (mg/L)	Kp (cm/hr)	OA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Arsenic	7440-38-2	0.0073	1.93E-03	0.95	NA	2.04E-07	3.00E-04	3.00E-04	NA	6.80E-04	6.80E-04	NA	1.63E-08	1.50E+00	1.50E+00	NA	2.45E-08	2.45E-08
bis(2-Chloroethyl)ether	111-44-4	0.48	1.80E-03	0.5	NA	1.25E-05	--	--	NA	NC	NC	NA	1.00E-06	1.10E+00	1.10E+00	NA	1.10E-06	1.10E-06
1,1,2,2-Tetrachloroethane	79-34-5	0.01	6.90E-03	0.7	NA	9.99E-07	6.00E-02	6.00E-02	NA	1.67E-05	1.67E-05	NA	7.99E-08	2.00E-01	2.00E-01	NA	1.60E-08	1.60E-08
1,1,2-Trichloroethane	79-00-5	0.002	6.43E-03	0.81	NA	2.27E-07	4.00E-03	4.00E-03	NA	5.68E-05	5.68E-05	NA	1.82E-08	5.70E-02	5.70E-02	NA	1.04E-09	1.04E-09
1,1-Dichloroethene	75-35-4	0.002	1.20E-02	1	NA	3.48E-07	5.00E-02	5.00E-02	NA	6.95E-06	6.95E-06	NA	2.78E-08	--	--	NA	NC	NC
1,2-Dichloroethane	107-06-2	0.032	4.20E-03	1	NA	1.95E-06	2.00E-02	2.00E-02	NA	9.73E-05	9.73E-05	NA	1.56E-07	9.10E-02	9.10E-02	NA	1.42E-08	1.42E-08
Benzene	71-43-2	0.043	1.50E-02	0.97	NA	9.34E-06	4.00E-03	4.00E-03	NA	2.34E-03	2.34E-03	NA	7.47E-07	5.50E-02	5.50E-02	NA	4.11E-08	4.11E-08
Chloroform	67-66-3	0.015	6.80E-03	1	NA	1.48E-06	1.00E-02	1.00E-02	NA	1.48E-04	1.48E-04	NA	1.18E-07	--	--	NA	NC	NC
cis-1,2-Dichloroethene	156-59-2	0.056	1.49E-02	1	NA	1.21E-05	1.00E-02	1.00E-02	NA	1.21E-03	1.21E-03	NA	9.67E-07	--	--	NA	NC	NC
Tetrachloroethene	127-18-4	0.001	3.30E-02	1	NA	4.12E-07	1.00E-02	1.00E-02	NA	4.12E-05	4.12E-05	NA	3.30E-08	5.40E-01	5.40E-01	NA	1.78E-08	1.78E-08
Trichloroethene	79-01-6	0.038	1.20E-02	1	NA	6.67E-06	3.00E-04	3.00E-04	NA	2.22E-02	2.22E-02	NA	5.33E-07	4.00E-01	4.00E-01	NA	2.13E-07	2.13E-07
Vinyl chloride	75-01-4c	0.018	5.60E-03	1	NA	1.46E-06	3.00E-03	3.00E-03	NA	4.87E-04	4.87E-04	NA	1.17E-07	1.40E+00	1.40E+00	NA	1.64E-07	1.64E-07
							Hazard Index:				2.73E-02			Total Cancer Risk:				1.59E-06

Notes:
NC: Risk not calculated. No toxicity value.

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Table B-73
Calculation of Potential Risks and Hazard indices
Recreational (Adult) (RME)
Sediment Cedar Swamp: CS -H1B (Culvert -Tide Gate): Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	0.5
SA: Skin Surface Area (cm2/d)	4940
DAF: Dermal Adherence Factor (mg/cm2)	0.3
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	8
ED: Exposure Duration (years)	24
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	8760
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times RAF \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	Cedar Swamp: CS -H1 Sediment (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Adjusted (mg/kg-day)	Sed HQ Ingestion	Sed HQ Dermal	Total Sed HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Sed Risk-Ingestion	Sed Risk-Dermal	Total Sed Risk
Chromium	7440-47-3	67	0.013	0.001	1.33E-08	3.03E-08	1.50E+00	1.95E-02	8.86E-09	1.55E-06	1.56E-06	4.25E-09	9.70E-09	--	--	NC	NC	NC
Mercury	7439-97-6	0.64	0.8	0.001	7.81E-09	2.90E-10	--	--	NC	NC	NC	2.50E-09	9.27E-11	--	--	NC	NC	NC
Lead	7439-92-1	237	0.15	0.001	5.43E-07	1.07E-07	Request	Request	Request	Request	Request	1.74E-07	3.43E-08	Request	Request	Request	Request	Request
Vanadium	7440-62-2	74	0.026	0.001	2.94E-08	3.35E-08	1.00E-03	2.60E-05	2.94E-05	1.29E-03	1.32E-03	9.40E-09	1.07E-08	--	--	NC	NC	NC
Total PCBs	1336-36-3	2.36	1	0.14	3.60E-08	1.49E-07	2.00E-05	2.00E-05	1.80E-03	7.46E-03	9.26E-03	1.15E-08	4.78E-08	2.00E+00	2.00E+00	2.30E-08	9.55E-08	1.19E-07
							Hazard Index:				1.06E-02			Total Cancer Risk:				1.19E-07

Notes:
NA : Not applicable to AOC or exposure

800413

Table B-74
Calculation of Potential Risks and Hazard indices
Recreational (Child) (RME)
Sediment Cedar Swamp: CS -H1B (Culvert -Tide Gate): Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	200
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	0.5
SA: Skin Surface Area (cm2/d)	2380
DAF: Dermal Adherence Factor (mg/cm2)	0.4
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	8
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	16.6
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times RAF \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	Cedar Swamp: CS -H1 Sediment (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Sed HQ Ingestion	Sed HQ Dermal	Total Sed HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Sed Risk-Ingestion	Sed Risk-Dermal	Total Sed Risk
Chromium	7440-47-3	67	0.013	0.001	1.15E-07	8.42E-08	1.50E+00	1.95E-02	7.67E-08	4.32E-06	4.40E-06	9.20E-09	6.74E-09	--	--	NC	NC	NC
Mercury	7439-97-6	0.64	0.8	0.001	6.76E-08	8.04E-10	--	--	NC	NC	NC	5.41E-09	6.44E-11	--	--	NC	NC	NC
Lead	7439-92-1	237	0.15	0.001	4.69E-06	2.98E-07	Request	Request	Request	Request	Request	3.76E-07	2.38E-08	Request	Request	Request	Request	Request
Vanadium	7440-62-2	74	0.026	0.001	2.54E-07	9.30E-08	1.00E-03	2.60E-05	2.54E-04	3.58E-03	3.83E-03	2.03E-08	7.44E-09	--	--	NC	NC	NC
Total PCBs	1336-36-3	2.36	1	0.14	3.11E-07	4.15E-07	2.00E-05	2.00E-05	1.56E-02	2.07E-02	3.63E-02	2.49E-08	3.32E-08	2.00E+00	2.00E+00	4.98E-08	6.64E-08	1.16E-07
							Hazard Index:				4.01E-02			Total Cancer Risk:				1.16E-07

Notes:
NA : Not applicable to AOC or exposure

Table B-75
Calculation of Potential Risks and Hazard indices
Recreational (Adult) (RME)
Sediment Little Timber Creek Swamp: LTCS-H3 (R130-R44): Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	100
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	0.5
SA: Skin Surface Area (cm2/d)	4940
DAF: Dermal Adherence Factor (mg/cm2)	0.3
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	8
ED: Exposure Duration (years)	24
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	8760
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FRx\ OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAFx\ SA \times RAF \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	Little Timber Creek Swamp: LTCS-H3 Sediment (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	Sed HQ Ingestion	Sed HQ Dermal	Total Sed HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Sed Risk-Ingestion	Sed Risk-Dermal	Total Sed Risk
Chromium	7440-47-3	104	0.013	0.001	2.06E-08	4.70E-08	1.50E+00	1.95E-02	1.38E-08	2.41E-06	2.43E-06	6.60E-09	1.51E-08	--	--	NC	NC	NC
Mercury	7439-97-6	1	0.8	0.001	1.22E-08	4.52E-10	--	--	NC	NC	NC	3.91E-09	1.45E-10	--	--	NC	NC	NC
Lead	7439-92-1	416	0.15	0.001	9.52E-07	1.88E-07	Request	Request	Request	Request	Request	3.05E-07	6.02E-08	Request	Request	Request	Request	Request
Vanadium	7440-62-2	82	0.026	0.001	3.25E-08	3.71E-08	1.00E-03	2.60E-05	3.25E-05	1.43E-03	1.46E-03	1.04E-08	1.19E-08	--	--	NC	NC	NC
Total PCBs	1336-36-3	5.7	1	0.14	8.70E-08	3.61E-07	2.00E-05	2.00E-05	4.35E-03	1.81E-02	2.24E-02	2.78E-08	1.16E-07	2.00E+00	2.00E+00	5.57E-08	2.31E-07	2.87E-07
							Hazard Index:				2.39E-02			Total Cancer Risk:				2.87E-07

Notes:
NA : Not applicable to AOC or exposure

800415

Table B-76
Calculation of Potential Risks and Hazard indices
Recreational (Child) (RME)
Sediment Little Timber Creek Swamp: LTCS-H3 (R130-R44): Ingestion and Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CS: Chemical Concentration in Soil (mg/kg)	Chemical-Specific
IR: Ingestion Rate (mg/day)	200
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	0.5
SA: Skin Surface Area (cm2/d)	2380
DAF: Dermal Adherence Factor (mg/cm2)	0.4
RAF: Relative Dermal Absorption Factor (unitless)	Chemical-Specific
EF: Exposure Frequency (days/year)	8
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	16.6
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (kg/mg)	1.00E-06

$$\text{ADD-Ingestion (mg/kg-day)} = \frac{CS \times IR \times FR \times OA \times EF \times ED \times CF}{BW \times AT}$$

$$\text{ADD-Dermal (mg/kg-day)} = \frac{CS \times DAF \times SA \times RAF \times EF \times ED \times CF}{BW \times AT}$$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	Little Timber Creek Swamp: LTCS-H3 Sediment (mg/kg)	OA	RAF	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-adjusted (mg/kg-day)	Sed HQ Ingestion	Sed HQ Dermal	Total Sed HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	Sed Risk-Ingestion	Sed Risk-Dermal	Total Sed Risk
Chromium	7440-47-3	104	0.013	0.001	1.79E-07	1.31E-07	1.50E+00	1.95E-02	1.19E-07	6.70E-06	6.82E-06	1.43E-08	1.05E-08	--	--	NC	NC	NC
Mercury	7439-97-6	1	0.8	0.001	1.06E-07	1.26E-09	--	--	NC	NC	NC	8.45E-09	1.01E-10	--	--	NC	NC	NC
Lead	7439-92-1	416	0.15	0.001	8.24E-06	5.23E-07	Request	Request	Request	Request	Request	6.59E-07	4.18E-08	Request	Request	Request	Request	Request
Vanadium	7440-62-2	82	0.026	0.001	2.81E-07	1.03E-07	1.00E-03	2.60E-05	2.81E-04	3.96E-03	4.25E-03	2.25E-08	8.25E-09	--	--	NC	NC	NC
Total PCBs	1336-36-3	5.7	1	0.14	7.53E-07	1.00E-06	2.00E-05	2.00E-05	3.76E-02	5.02E-02	8.78E-02	6.02E-08	8.02E-08	2.00E+00	2.00E+00	1.20E-07	1.60E-07	2.81E-07
							Hazard Index:				9.20E-02			Total Cancer Risk:				2.81E-07

Notes:
NA : Not applicable to AOC or exposure

Table B-77
Calculation of Potential Risks and Hazard indices
Recreational (Adult) (RME)
Surface Water Cedar Swamp: CS -H1B (Culvert -Tide Gate): Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	NA
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	NA
SA: Skin Surface Area (cm2/event)	2206
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	8
ED: Exposure Duration (years)	24
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	8760
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

ADD-Dermal (mg/kg-day) = $\frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	Cedar Swamp: CS -H1 Surface Water (mg/L)	Kp (cm/hr)	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD: Adjusted (mg/kg-day)	SW HQ Ingestion	SW HQ Dermal	Total SW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF: adjusted [1/(mg/kg-day)]	SW Risk-Ingestion	SW Risk-Dermal	Total SW Risk
Aluminum	7429-90-5	0.145	2.14E-03	NA	2.09E-07	1.00E+00	1.00E-01	NA	2.09E-06	2.09E-06	NA	6.69E-08	--	--	NA	NC	NC
4-Methyl-2-pentanone	108-10-1	0.095	3.97E-03	NA	2.54E-07	8.00E-02	8.00E-02	NA	3.17E-06	3.17E-06	NA	8.13E-08	--	--	NA	NC	NC
Phenanthrene	85-01-8	0.001	1.40E-01	NA	9.43E-08	Request	Request	NA	Request	Request	NA	3.02E-08	Request	Request	NA	Request	Request
1,1,2,2-Tetrachloroethane	79-34-5	0.018	6.90E-03	NA	8.36E-08	6.00E-02	6.00E-02	NA	1.39E-06	1.39E-06	NA	2.68E-08	2.00E-01	2.00E-01	NA	5.35E-09	5.35E-09
1,1,2-Trichloroethane	79-00-5	0.022	6.43E-03	NA	9.53E-08	4.00E-03	4.00E-03	NA	2.38E-05	2.38E-05	NA	3.05E-08	5.70E-02	5.70E-02	NA	1.74E-09	1.74E-09
1,1-Dichloroethane	75-34-3	0.026	6.70E-03	NA	1.17E-07	1.00E-01	1.00E-01	NA	1.17E-06	1.17E-06	NA	3.75E-08	--	--	NA	NC	NC
1,1-Dichloroethene	75-35-4	0.026	1.20E-02	NA	2.10E-07	5.00E-02	5.00E-02	NA	4.20E-06	4.20E-06	NA	6.72E-08	--	--	NA	NC	NC
1,2-Dichloroethane	107-06-2	0.026	4.20E-03	NA	7.35E-08	2.00E-02	2.00E-02	NA	3.68E-06	3.68E-06	NA	2.35E-08	9.10E-02	9.10E-02	NA	2.14E-09	2.14E-09
1,2-Dichloropropane	78-87-5	0.02	7.80E-03	NA	1.05E-07	--	--	NA	NC	NC	NA	3.36E-08	6.80E-02	6.80E-02	NA	2.29E-09	2.29E-09
2-Butanone	78-93-3	0.13	9.60E-04	NA	8.40E-08	6.00E-01	6.00E-01	NA	1.40E-07	1.40E-07	NA	2.69E-08	--	--	NA	NC	NC
2-Hexanone	591-78-6	0.094	4.45E-03	NA	2.82E-07	4.00E-02	4.00E-02	NA	7.04E-06	7.04E-06	NA	9.01E-08	--	--	NA	NC	NC
Acetone	67-64-1	0.15	5.69E-04	NA	5.75E-08	9.00E-01	9.00E-01	NA	6.39E-08	6.39E-08	NA	1.84E-08	--	--	NA	NC	NC
Benzene	71-43-2	0.022	1.50E-02	NA	2.22E-07	4.00E-03	4.00E-03	NA	5.56E-05	5.56E-05	NA	7.11E-08	5.50E-02	5.50E-02	NA	3.91E-09	3.91E-09
Bromodichloromethane	75-27-4	0.024	4.60E-03	NA	7.43E-08	2.00E-02	2.00E-02	NA	3.72E-06	3.72E-06	NA	2.38E-08	6.20E-02	6.20E-02	NA	1.47E-09	1.47E-09
Bromoform	75-25-2	0.023	2.77E-03	NA	4.29E-08	2.00E-02	2.00E-02	NA	2.15E-06	2.15E-06	NA	1.37E-08	7.90E-03	7.90E-03	NA	1.08E-10	1.08E-10
Carbon disulfide	75-15-0	0.027	1.70E-02	NA	3.09E-07	1.00E-01	1.00E-01	NA	3.09E-06	3.09E-06	NA	9.89E-08	--	--	NA	NC	NC
Carbon Tetrachloride	56-23-5	0.029	1.60E-02	NA	3.12E-07	7.00E-04	7.00E-04	NA	4.46E-04	4.46E-04	NA	1.00E-07	1.30E-01	1.30E-01	NA	1.30E-08	1.30E-08
Chlorobenzene	108-90-7	0.023	2.80E-02	NA	4.34E-07	2.00E-02	6.20E-03	NA	6.99E-05	6.99E-05	NA	1.39E-07	--	--	NA	NC	NC
Chloroethane	75-00-3	0.017	6.10E-03	NA	6.98E-08	4.00E-01	4.00E-01	NA	1.75E-07	1.75E-07	NA	2.23E-08	2.90E-03	2.90E-03	NA	6.48E-11	6.48E-11
Chloroform	67-66-3	0.024	6.80E-03	NA	1.10E-07	1.00E-02	1.00E-02	NA	1.10E-05	1.10E-05	NA	3.52E-08	--	--	NA	NC	NC
Chloromethane	74-87-3	0.017	3.30E-03	NA	3.78E-08	--	--	NA	NC	NC	NA	1.21E-08	--	--	NA	NC	NC
cis-1,2-Dichloroethene	156-59-2	0.026	1.49E-02	NA	2.61E-07	1.00E-02	1.00E-02	NA	2.61E-05	2.61E-05	NA	8.35E-08	--	--	NA	NC	NC
cis-1,3-Dichloropropene	10061-01-5	0.021	4.30E-03	NA	6.08E-08	Request	Request	NA	Request	Request	NA	1.95E-08	Request	Request	NA	Request	Request
Dibromochloromethane	124-48-1	0.024	3.49E-03	NA	5.64E-08	2.00E-02	2.00E-02	NA	2.82E-06	2.82E-06	NA	1.80E-08	8.40E-02	8.40E-02	NA	1.52E-09	1.52E-09
trans-1,3-Dichloropropene	10061-02-6	0.021	4.30E-03	NA	6.08E-08	Request	Request	NA	Request	Request	NA	1.95E-08	Request	Request	NA	Request	Request
Methylene chloride	75-09-2	0.025	3.50E-03	NA	5.89E-08	6.00E-02	6.00E-02	NA	9.82E-07	9.82E-07	NA	1.89E-08	7.50E-03	7.50E-03	NA	1.41E-10	1.41E-10
Styrene	100-42-5	0.023	3.70E-02	NA	5.73E-07	2.00E-01	2.00E-01	NA	2.87E-06	2.87E-06	NA	1.83E-07	--	--	NA	NC	NC
Tetrachloroethene	127-18-4	0.025	3.30E-02	NA	5.56E-07	1.00E-02	1.00E-02	NA	5.56E-05	5.56E-05	NA	1.78E-07	5.40E-01	5.40E-01	NA	9.60E-08	9.60E-08
Trichloroethene	79-01-6	0.023	1.20E-02	NA	1.86E-07	3.00E-04	3.00E-04	NA	6.20E-04	6.20E-04	NA	5.95E-08	4.00E-01	4.00E-01	NA	2.38E-08	2.38E-08
Vinyl chloride	75-01-4a	0.018	5.60E-03	NA	6.79E-08	3.00E-03	3.00E-03	NA	2.26E-05	2.26E-05	NA	2.17E-08	7.20E-01	7.20E-01	NA	1.56E-08	1.56E-08
Xylenes (Total)	1330-20-7	0.069	7.04E-02	NA	3.27E-06	2.00E-01	2.00E-01	NA	1.64E-05	1.64E-05	NA	1.05E-06	--	--	NA	NC	NC
Total PCBs	1336-36-3	0.00003	9.22E-01	NA	2.08E-08	2.00E-05	2.00E-05	NA	1.04E-03	1.04E-03	NA	6.66E-09	2.00E+00	2.00E+00	NA	1.33E-08	1.33E-08
						Hazard Index:				2.43E-03			Total Cancer Risk:				1.80E-07

Notes:
NA : Not applicable to AOC or exposure

800417

Table B-78
Calculation of Potential Risks and Hazard indices
Recreational (Child) (RME)
Surface Water Cedar Swamp: CS -H1B (Culvert -Tide Gate): Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	NA
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	NA
SA: Skin Surface Area (cm2/event)	807
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	8
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	16.6
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

ADD-Dermal (mg/kg-day) = $\frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	Cedar Swamp: CS -H1 Surface Water (mg/L)	Kp (cm/hr)	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD: Adjusted (mg/kg-day)	SW HQ Ingestion	SW HQ Dermal	Total SW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	SW Risk-Ingestion	SW Risk-Dermal	Total SW Risk
Aluminum	7429-90-5	0.145	2.14E-03	NA	3.31E-07	1.00E+00	1.00E-01	NA	3.31E-06	3.31E-06	NA	2.65E-08	--	--	NA	NC	NC
4-Methyl-2-pentanone	108-10-1	0.095	3.97E-03	NA	4.02E-07	8.00E-02	8.00E-02	NA	5.02E-06	5.02E-06	NA	3.21E-08	--	--	NA	NC	NC
Phenanthrene	85-01-8	0.001	1.40E-01	NA	1.49E-07	Request	Request	NA	Request	Request	NA	1.19E-08	Request	Request	NA	Request	Request
1,1,2,2-Tetrachloroethane	79-34-5	0.018	6.90E-03	NA	1.32E-07	6.00E-02	6.00E-02	NA	2.21E-06	2.21E-06	NA	1.06E-08	2.00E-01	2.00E-01	NA	2.12E-09	2.12E-09
1,1,2-Trichloroethane	79-00-5	0.022	6.43E-03	NA	1.51E-07	4.00E-03	4.00E-03	NA	3.77E-05	3.77E-05	NA	1.21E-08	5.70E-02	5.70E-02	NA	6.87E-10	6.87E-10
1,1-Dichloroethane	75-34-3	0.026	6.70E-03	NA	1.86E-07	1.00E-01	1.00E-01	NA	1.86E-06	1.86E-06	NA	1.48E-08	--	--	NA	NC	NC
1,1-Dichloroethene	75-35-4	0.026	1.20E-02	NA	3.32E-07	5.00E-02	5.00E-02	NA	6.65E-06	6.65E-06	NA	2.66E-08	--	--	NA	NC	NC
1,2-Dichloroethane	107-06-2	0.026	4.20E-03	NA	1.16E-07	2.00E-02	2.00E-02	NA	5.82E-06	5.82E-06	NA	9.31E-09	9.10E-02	9.10E-02	NA	8.47E-10	8.47E-10
1,2-Dichloropropane	78-87-5	0.02	7.80E-03	NA	1.66E-07	--	--	NA	NC	NC	NA	1.33E-08	6.80E-02	6.80E-02	NA	9.04E-10	9.04E-10
2-Butanone	78-93-3	0.13	9.60E-04	NA	1.33E-07	6.00E-01	6.00E-01	NA	2.22E-07	2.22E-07	NA	1.06E-08	--	--	NA	NC	NC
2-Hexanone	591-78-6	0.094	4.45E-03	NA	4.46E-07	4.00E-02	4.00E-02	NA	1.11E-05	1.11E-05	NA	3.57E-08	--	--	NA	NC	NC
Acetone	67-64-1	0.15	5.69E-04	NA	9.09E-08	9.00E-01	9.00E-01	NA	1.01E-07	1.01E-07	NA	7.28E-09	--	--	NA	NC	NC
Benzene	71-43-2	0.022	1.50E-02	NA	3.52E-07	4.00E-03	4.00E-03	NA	8.79E-05	8.79E-05	NA	2.81E-08	5.50E-02	5.50E-02	NA	1.55E-09	1.55E-09
Bromodichloromethane	75-27-4	0.024	4.60E-03	NA	1.18E-07	2.00E-02	2.00E-02	NA	5.88E-06	5.88E-06	NA	9.41E-09	6.20E-02	6.20E-02	NA	5.83E-10	5.83E-10
Bromoform	75-25-2	0.023	2.77E-03	NA	6.79E-08	2.00E-02	2.00E-02	NA	3.39E-06	3.39E-06	NA	5.43E-09	7.90E-03	7.90E-03	NA	4.29E-11	4.29E-11
Carbon disulfide	75-15-0	0.027	1.70E-02	NA	4.89E-07	1.00E-01	1.00E-01	NA	4.89E-06	4.89E-06	NA	3.91E-08	--	--	NA	NC	NC
Carbon Tetrachloride	56-23-5	0.029	1.60E-02	NA	4.94E-07	7.00E-04	7.00E-04	NA	7.06E-04	7.06E-04	NA	3.96E-08	1.30E-01	1.30E-01	NA	5.14E-09	5.14E-09
Chlorobenzene	108-90-7	0.023	2.80E-02	NA	6.86E-07	2.00E-02	6.20E-03	NA	1.11E-04	1.11E-04	NA	5.49E-08	--	--	NA	NC	NC
Chloroethane	75-00-3	0.017	6.10E-03	NA	1.10E-07	4.00E-01	4.00E-01	NA	2.76E-07	2.76E-07	NA	8.84E-09	2.90E-03	2.90E-03	NA	2.56E-11	2.56E-11
Chloroform	67-66-3	0.024	6.80E-03	NA	1.74E-07	1.00E-02	1.00E-02	NA	1.74E-05	1.74E-05	NA	1.39E-08	--	--	NA	NC	NC
Chloromethane	74-87-3	0.017	3.30E-03	NA	5.98E-08	--	--	NA	NC	NC	NA	4.78E-09	--	--	NA	NC	NC
cis-1,2-Dichloroethene	156-59-2	0.026	1.49E-02	NA	4.13E-07	1.00E-02	1.00E-02	NA	4.13E-05	4.13E-05	NA	3.30E-08	--	--	NA	NC	NC
cis-1,3-Dichloropropene	10061-01-5	0.021	4.30E-03	NA	9.62E-08	Request	Request	NA	Request	Request	NA	7.70E-09	Request	Request	NA	Request	Request
Dibromochloromethane	124-48-1	0.024	3.49E-03	NA	8.92E-08	2.00E-02	2.00E-02	NA	4.46E-06	4.46E-06	NA	7.14E-09	8.40E-02	8.40E-02	NA	6.00E-10	6.00E-10
trans-1,3-Dichloropropene	10061-02-6	0.021	4.30E-03	NA	9.62E-08	Request	Request	NA	Request	Request	NA	7.70E-09	Request	Request	NA	Request	Request
Methylene chloride	75-09-2	0.025	3.50E-03	NA	9.32E-08	6.00E-02	6.00E-02	NA	1.55E-06	1.55E-06	NA	7.46E-09	7.50E-03	7.50E-03	NA	5.59E-11	5.59E-11
Styrene	100-42-5	0.023	3.70E-02	NA	9.07E-07	2.00E-01	2.00E-01	NA	4.53E-06	4.53E-06	NA	7.25E-08	--	--	NA	NC	NC
Tetrachloroethene	127-18-4	0.025	3.30E-02	NA	8.79E-07	1.00E-02	1.00E-02	NA	8.79E-05	8.79E-05	NA	7.03E-08	5.40E-01	5.40E-01	NA	3.80E-08	3.80E-08
Trichloroethene	79-01-6	0.023	1.20E-02	NA	2.94E-07	3.00E-04	3.00E-04	NA	9.80E-04	9.80E-04	NA	2.35E-08	4.00E-01	4.00E-01	NA	9.41E-09	9.41E-09
Vinyl chloride	75-01-4c	0.018	5.60E-03	NA	1.07E-07	3.00E-03	3.00E-03	NA	3.58E-05	3.58E-05	NA	8.59E-09	1.40E+00	1.40E+00	NA	1.20E-08	1.20E-08
Xylenes (Total)	1330-20-7	0.069	7.04E-02	NA	5.18E-06	2.00E-01	2.00E-01	NA	2.59E-05	2.59E-05	NA	4.14E-07	--	--	NA	NC	NC
Total PCBs	1336-36-3	0.00003	9.22E-01	NA	3.29E-08	2.00E-05	2.00E-05	NA	1.65E-03	1.65E-03	NA	2.63E-09	2.00E+00	2.00E+00	NA	5.27E-09	5.27E-09
						Hazard Index:				3.84E-03			Total Cancer Risk:				7.72E-08

Notes:
NA : Not applicable to AOC or exposure

Table B-79
Calculation of Potential Risks and Hazard Indices
Recreational (Adult) (RME)
Surface Water Little Timber Creek Swamp: LTCS-H3 (R130-R44): Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	NA
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	NA
SA: Skin Surface Area (cm2/d)	2206
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	8
ED: Exposure Duration (years)	24
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	8760
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

ADD-Dermal (mg/kg-day) = $\frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	Little Timber Creek Swamp: LTCS-H3 Surface Water (mg/L)	Kp (cm/hr)	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD Adjusted (mg/kg-day)	SW HQ Ingestion	SW HQ Dermal	Total SW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	SW Risk-Ingestion	SW Risk-Dermal	Total SW Risk
Aluminum	7429-90-5	0.145	2.14E-03	NA	2.09E-07	1.00E+00	1.00E-01	NA	2.09E-06	2.09E-06	NA	6.69E-08	--	--	NA	NC	NC
Phenanthrene	85-01-8	0.001	1.40E-01	NA	9.43E-08	Request	Request	NA	Request	Request	NA	3.02E-08	Request	Request	NA	Request	Request
Total PCBs	1336-36-3	0.000084	9.22E-01	NA	5.22E-08	2.00E-05	2.00E-05	NA	2.61E-03	2.61E-03	NA	1.67E-08	2.00E+00	2.00E+00	NA	3.34E-08	3.34E-08
						Hazard Index:				2.61E-03			Total Cancer Risk:				3.34E-08

Notes:
NA : Not applicable to AOC or exposure

800419

Table B-80
Calculation of Potential Risks and Hazard indices
Recreational (Child) (RME)
Surface Water Little Timber Creek Swamp: LTCS-H3 (R130-R44): Dermal Contact
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	NA
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	NA
SA: Skin Surface Area (cm2/d)	807
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	1
EF: Exposure Frequency (days/year)	8
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	16.6
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific
CF: Conversion factor (L/cm3)	1.00E-03

ADD-Dermal (mg/kg-day) = $\frac{CW \times SA \times KP \times ET \times EF \times ED \times CF}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	Little Timber Creek Swamp: LTCS-H3 Surface Water (mg/L)	Kp (cm/hr)	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD: Adjusted (mg/kg-day)	SW HQ Ingestion	SW HQ Dermal	Total SW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF: adjusted [1/(mg/kg-day)]	SW Risk-Ingestion	SW Risk-Dermal	Total SW Risk
Aluminum	7429-90-5	0.145	2.14E-03	NA	3.31E-07	1.00E+00	1.00E-01	NA	3.31E-06	3.31E-06	NA	2.65E-08	--	--	NA	NC	NC
Phenanthrene	85-01-8	0.001	1.40E-01	NA	1.49E-07	Request	Request	NA	Request	Request	NA	1.19E-08	Request	Request	NA	Request	Request
Total PCBs	1336-36-3	0.00008	9.22E-01	NA	8.25E-08	2.00E-05	2.00E-05	NA	4.13E-03	4.13E-03	NA	6.60E-09	2.00E+00	2.00E+00	NA	1.32E-08	1.32E-08
						Hazard Index:				4.13E-03			Total Cancer Risk:				1.32E-08

Notes:
NA : Not applicable to AOC or exposure

Table B-81
Calculation of Potential Risks and Hazard Indices
Recreational (Adult) (RME)
Ground water AOC-1c: Ingestion: Fountain
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	2.3
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	0.1
SA: Skin Surface Area (cm2/event)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	8
ED: Exposure Duration (years)	24
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	8760
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-1c Ground water (mg/L)	Kp (cm/hr)	OA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Arsenic	7440-38-2	0.0091	1.93E-03	0.95	6.07E-07	NA	3.00E-04	3.00E-04	2.02E-03	NA	2.02E-03	1.94E-07	NA	1.50E+00	1.50E+00	2.91E-07	NA	2.91E-07
							Hazard Index:				2.02E-03			Total Cancer Risk:				2.91E-07

Notes:
NA : Not applicable to AOC or exposure

800421

Table B-82
Calculation of Potential Risks and Hazard indices
Recreational (Child) (RME)
Ground water AOC-1c: Ingestion: Fountain
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	1.5
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	0.1
SA: Skin Surface Area (cm2/event)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	8
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	16.6
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

					Noncancer Hazard Quotient							Excess Lifetime Cancer Risk						
Compound	CASRN	AOC-1c Ground water (mg/L)	Kp (cm/hr)	OA	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Arsenic	7440-38-2	0.0091	1.93E-03	0.95	1.71E-06	NA	3.00E-04	3.00E-04	5.71E-03	NA	5.71E-03	1.37E-07	NA	1.50E+00	1.50E+00	2.05E-07	NA	2.05E-07
							Hazard Index:				5.71E-03			Total Cancer Risk:				2.05E-07

Notes:
NA : Not applicable to AOC or exposure

800422

Table B-83a
Calculation of Potential Risks and Hazard Indices
Recreational (Adult) (RME)
Ground water AOC-3: Ingestion: Fountain
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	2.3
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	0.1
SA: Skin Surface Area (cm2/d)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	8
ED: Exposure Duration (years)	24
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	8760
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

		AOC-3			Noncancer Hazard Quotient							Excess Lifetime Cancer Risk					
Compound	CASRN	Ground water (mg/L)	Kp (cm/hr)	OA	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Aluminum	7429-90-5	473	2.14E-03	0.1	3.32E-03	NA	1.00E+00	1.00E-01	3.32E-03	NA	3.32E-03	1.06E-03	NA	--	--	NC	NA	NC
Arsenic	7440-38-2	0.006	1.93E-03	0.95	4.03E-07	NA	3.00E-04	3.00E-04	1.34E-03	NA	1.34E-03	1.29E-07	NA	1.50E+00	1.50E+00	1.94E-07	NA	1.94E-07
Beryllium	7440-41-7	0.0216	6.60E-04	0.007	1.06E-08	NA	2.00E-03	1.40E-05	5.31E-06	NA	5.31E-06	3.40E-09	NA	--	--	NC	NA	NC
Chromium	7440-47-3	0.969	1.00E-03	0.013	8.84E-07	NA	1.50E+00	1.95E-02	5.90E-07	NA	5.90E-07	2.83E-07	NA	--	--	NC	NA	NC
Cobalt	7440-48-4	0.104	4.00E-04	0.8	5.84E-06	NA	2.00E-02	2.00E-02	2.92E-04	NA	2.92E-04	1.87E-06	NA	--	--	NC	NA	NC
Lead	7439-92-1	0.147	1.00E-04	0.15	1.55E-06	NA	Request	Request	Request	NA	Request	4.95E-07	NA	Request	Request	Request	NA	Request
Nickel	7440-02-0	0.451	2.00E-04	0.04	1.27E-06	NA	2.00E-02	8.00E-04	6.33E-05	NA	6.33E-05	4.05E-07	NA	--	--	NC	NA	NC
Selenium	7782-49-2	0.032	9.03E-04	0.8	1.82E-06	NA	5.00E-03	5.00E-03	3.64E-04	NA	3.64E-04	5.82E-07	NA	--	--	NC	NA	NC
Thallium	7440-28-0	0.048	1.57E-04	1	3.34E-06	NA	7.00E-05	7.00E-05	4.78E-02	NA	4.78E-02	1.07E-06	NA	--	--	NC	NA	NC
Vanadium	7440-62-2	2.08	1.35E-03	0.026	3.80E-06	NA	1.00E-03	2.60E-05	3.80E-03	NA	3.80E-03	1.22E-06	NA	--	--	NC	NA	NC
Zinc	7440-66-6	38.1	6.00E-04	0.2	5.35E-04	NA	3.00E-01	6.00E-02	1.78E-03	NA	1.78E-03	1.71E-04	NA	--	--	NC	NA	NC
4-Chloroaniline	106-47-8	0.072	6.33E-03	0.5	2.53E-06	NA	4.00E-03	4.00E-03	6.32E-04	NA	6.32E-04	8.09E-07	NA	5.40E-02	5.40E-02	4.37E-08	NA	4.37E-08
4-Methyl-2-pentanone	108-10-1	6.5	3.97E-03	0.8	3.65E-04	NA	8.00E-02	8.00E-02	4.56E-03	NA	4.56E-03	1.17E-04	NA	--	--	NC	NA	NC
bis(2-Chloroethyl)ether	111-44-4	3.8	1.80E-03	0.5	1.33E-04	NA	--	--	NC	NA	NC	4.27E-05	NA	1.10E+00	1.10E+00	4.70E-05	NA	4.70E-05
Isophorone	78-59-1	2.3	3.40E-03	0.5	8.07E-05	NA	2.00E-01	2.00E-01	4.04E-04	NA	4.04E-04	2.58E-05	NA	9.50E-04	9.50E-04	2.45E-08	NA	2.45E-08
Naphthalene	91-20-3	0.044	4.70E-02	0.89	2.75E-06	NA	2.00E-02	2.00E-02	1.37E-04	NA	1.37E-04	8.80E-07	NA	--	--	NC	NA	NC
Nitrobenzene	98-95-3	0.001	6.96E-03	0.97	6.81E-08	NA	5.00E-04	5.00E-04	1.36E-04	NA	1.36E-04	2.18E-08	NA	--	--	NC	NA	NC
Phenanthrene	85-01-8	0.001	1.40E-01	0.89	3.83E-08	NA	Request	Request	Request	NA	Request	1.23E-08	NA	Request	Request	Request	NA	Request
1,1,1-Trichloroethane	71-55-6	0.038	1.30E-02	0.9	2.42E-06	NA	2.80E-01	2.80E-01	8.63E-06	NA	8.63E-06	7.73E-07	NA	--	--	NC	NA	NC
1,1,2,2-Tetrachloroethane	79-34-5	0.103	6.90E-03	0.7	5.08E-06	NA	6.00E-02	6.00E-02	8.47E-05	NA	8.47E-05	1.63E-06	NA	2.00E-01	2.00E-01	3.25E-07	NA	3.25E-07
1,1,2-Trichloroethane	79-00-5	0.014	6.43E-03	0.81	8.07E-07	NA	4.00E-03	4.00E-03	2.02E-04	NA	2.02E-04	2.58E-07	NA	5.70E-02	5.70E-02	1.47E-08	NA	1.47E-08
1,1-Dichloroethane	75-34-3	0.072	6.70E-03	1	5.09E-06	NA	1.00E-01	1.00E-01	5.09E-05	NA	5.09E-05	1.63E-06	NA	--	--	NC	NA	NC
1,1-Dichloroethene	75-35-4	0.063	1.20E-02	1	4.44E-06	NA	5.00E-02	5.00E-02	8.88E-05	NA	8.88E-05	1.42E-06	NA	--	--	NC	NA	NC
1,2,4-Trichlorobenzene	120-82-1	0.001	6.60E-02	0.97	6.81E-08	NA	1.00E-02	1.00E-02	6.81E-06	NA	6.81E-06	2.18E-08	NA	--	--	NC	NA	NC
1,2-Dichlorobenzene	95-50-1	0.076	4.10E-02	0.8	4.27E-06	NA	9.00E-02	9.00E-02	4.74E-05	NA	4.74E-05	1.37E-06	NA	--	--	NC	NA	NC
1,2-Dichloroethane	107-06-2	0.47	4.20E-03	1	3.30E-05	NA	2.00E-02	2.00E-02	1.65E-03	NA	1.65E-03	1.06E-05	NA	9.10E-02	9.10E-02	9.61E-07	NA	9.61E-07
1,2-Dichloropropane	78-87-5	0.103	7.80E-03	0.74	5.35E-06	NA	--	--	NC	NA	NC	1.71E-06	NA	6.80E-02	6.80E-02	1.16E-07	NA	1.16E-07
1,3-Dichlorobenzene	541-73-1	0.001	5.80E-02	0.8	5.62E-08	NA	3.00E-02	3.00E-02	1.87E-06	NA	1.87E-06	1.80E-08	NA	--	--	NC	NA	NC
1,4-Dichlorobenzene	106-46-7	0.006	4.20E-02	0.9	3.79E-07	NA	3.00E-02	3.00E-02	1.26E-05	NA	1.26E-05	1.21E-07	NA	2.40E-02	2.40E-02	2.91E-09	NA	2.91E-09
2-Butanone	78-93-3	5.1	9.60E-04	0.8	2.86E-04	NA	6.00E-01	6.00E-01	4.77E-04	NA	4.77E-04	9.17E-05	NA	--	--	NC	NA	NC
Acetone	67-64-1	37.5	5.69E-04	0.83	2.19E-03	NA	9.00E-01	9.00E-01	2.43E-03	NA	2.43E-03	6.99E-04	NA	--	--	NC	NA	NC
Benzene	71-43-2	0.793	1.50E-02	0.97	5.40E-05	NA	4.00E-03	4.00E-03	1.35E-02	NA	1.35E-02	1.73E-05	NA	5.50E-02	5.50E-02	9.50E-07	NA	9.50E-07
Carbon disulfide	75-15-0	2.2	1.70E-02	0.63	9.73E-05	NA	1.00E-01	1.00E-01	9.73E-04	NA	9.73E-04	3.11E-05	NA	--	--	NC	NA	NC
Chlorobenzene	108-90-7	0.08	2.80E-02	0.31	1.74E-06	NA	2.00E-02	6.20E-03	8.71E-05	NA	8.71E-05	5.57E-07	NA	--	--	NC	NA	NC
Chloroethane	75-00-3	0.008	6.10E-03	0.8	4.52E-07	NA	4.00E-01	4.00E-01	1.13E-06	NA	1.13E-06	1.45E-07	NA	2.90E-03	2.90E-03	4.19E-10	NA	4.19E-10
Chloroform	67-66-3	0.07	6.80E-03	1	4.91E-06	NA	1.00E-02	1.00E-02	4.91E-04	NA	4.91E-04	1.57E-06	NA	--	--	NC	NA	NC
cis-1,2-Dichloroethene	156-59-2	1.7	1.49E-02	1	1.19E-04	NA	1.00E-02	1.00E-02	1.19E-02	NA	1.19E-02	3.82E-05	NA	--	--	NC	NA	NC
Ethylbenzene	100-41-4	0.44	4.90E-02	0.97	3.00E-05	NA	1.00E-01	1.00E-01	3.00E-04	NA	3.00E-04	9.59E-06	NA	--	--	NC	NA	NC
Methylene chloride	75-09-2	2.4	3.50E-03	0.95	1.60E-04	NA	6.00E-02	6.00E-02	2.67E-03	NA	2.67E-03	5.12E-05	NA	7.50E-03	7.50E-03	3.84E-07	NA	3.84E-07
Tetrachloroethene	127-18-4	0.067	3.30E-02	1	4.70E-06	NA	1.00E-02	1.00E-02	4.70E-04	NA	4.70E-04	1.51E-06	NA	5.40E-01	5.40E-01	8.13E-07	NA	8.13E-07
Toluene	108-88-3	2.9	3.10E-02	0.8	1.63E-04	NA	2.00E-01	2.00E-01	8.14E-04	NA	8.14E-04	5.21E-05	NA	--	--	NC	NA	NC
trans-1,2-Dichloroethene	156-60-5	0.024	7.70E-03	1	1.69E-06	NA	2.00E-02	2.00E-02	8.43E-05	NA	8.43E-05	5.39E-07	NA	--	--	NC	NA	NC
Trichloroethene	79-01-6	5.8	1.20E-02	1	4.07E-04	NA	3.00E-04	3.00E-04	1.36E+00	NA	1.36E+00	1.30E-04	NA	4.00E-01	4.00E-01	5.21E-05	NA	5.21E-05
Vinyl chloride	75-01-4a	0.093	5.60E-03	1	6.53E-06	NA	3.00E-03	3.00E-03	2.18E-03	NA	2.18E-03	2.09E-06	NA	7.20E-01	7.20E-01	1.50E-06	NA	1.50E-06
Xylenes (Total)	1330-20-7	1.4	7.04E-02	0.92	9.04E-05	NA	2.00E-01	2.00E-01	4.52E-04	NA	4.52E-04	2.89E-05	NA	--	--	NC	NA	NC
							Hazard Index:				1.46E+00			Total Cancer Risk:				1.04E-04

Notes:
NA : Not applicable to AOC or exposure

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Table B-83b
Calculation of Potential Risks and Hazard indices
Recreational (Adult) (CTE)
Ground water AOC-3: Ingestion: Fountain
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	*Chemical-Specific*
IR: Ingestion Rate (L/day)	1.3
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	0.1
SA: Skin Surface Area (cm2/d)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	4
ED: Exposure Duration (years)	24
BW: Body Weight (kg)	71.8
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	8760
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)
Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

					Noncancer Hazard Quotient							Excess Lifetime Cancer Risk						
Compound	CASRN	AOC-3 Ground water (mg/L)	Kp (cm/hr)	OA	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD-Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Aluminum	7429-90-5	473	2.14E-03	0.1	9.39E-04	NA	1.00E+00	1.00E-01	9.39E-04	NA	9.39E-04	3.00E-04	NA	--	--	NC	NA	NC
Arsenic	7440-38-2	0.006	1.93E-03	0.95	1.14E-07	NA	3.00E-04	3.00E-04	3.80E-04	NA	3.80E-04	3.65E-08	NA	1.50E+00	1.50E+00	5.47E-08	NA	5.47E-08
Beryllium	7440-41-7	0.0216	6.60E-04	0.007	3.00E-09	NA	2.00E-03	1.40E-05	1.50E-06	NA	1.50E-06	9.60E-10	NA	--	--	NC	NA	NC
Chromium	7440-47-3	0.969	1.00E-03	0.013	2.50E-07	NA	1.50E+00	1.95E-02	1.67E-07	NA	1.67E-07	8.00E-08	NA	--	--	NC	NA	NC
Cobalt	7440-48-4	0.104	4.00E-04	0.8	1.65E-06	NA	2.00E-02	2.00E-02	8.25E-05	NA	8.25E-05	5.28E-07	NA	--	--	NC	NA	NC
Lead	7439-92-1	0.147	1.00E-04	0.15	4.38E-07	NA	Request	Request	Request	NA	Request	1.40E-07	NA	Request	Request	Request	NA	Request
Nickel	7440-02-0	0.451	2.00E-04	0.04	3.58E-07	NA	2.00E-02	8.00E-04	1.79E-05	NA	1.79E-05	1.15E-07	NA	--	--	NC	NA	NC
Selenium	7782-49-2	0.032	9.03E-04	0.8	5.14E-07	NA	5.00E-03	5.00E-03	1.03E-04	NA	1.03E-04	1.64E-07	NA	--	--	NC	NA	NC
Thallium	7440-28-0	0.048	1.57E-04	1	9.45E-07	NA	7.00E-05	7.00E-05	1.35E-02	NA	1.35E-02	3.02E-07	NA	--	--	NC	NA	NC
Vanadium	7440-62-2	2.08	1.35E-03	0.026	1.07E-06	NA	1.00E-03	2.60E-05	1.07E-03	NA	1.07E-03	3.43E-07	NA	--	--	NC	NA	NC
Zinc	7440-66-6	38.1	6.00E-04	0.2	1.51E-04	NA	3.00E-01	6.00E-02	5.04E-04	NA	5.04E-04	4.84E-05	NA	--	--	NC	NA	NC
4-Chloroaniline	106-47-8	0.072	6.33E-03	0.5	7.14E-07	NA	4.00E-03	4.00E-03	1.79E-04	NA	1.79E-04	2.29E-07	NA	5.40E-02	5.40E-02	1.23E-08	NA	1.23E-08
4-Methyl-2-pentanone	108-10-1	6.5	3.97E-03	0.8	1.03E-04	NA	8.00E-02	8.00E-02	1.29E-03	NA	1.29E-03	3.30E-05	NA	--	--	NC	NA	NC
bis(2-Chloroethyl)ether	111-44-4	3.8	1.80E-03	0.5	3.77E-05	NA	--	--	NC	NA	NC	1.21E-05	NA	1.10E+00	1.10E+00	1.33E-05	NA	1.33E-05
Isophorone	78-59-1	2.3	3.40E-03	0.5	2.28E-05	NA	2.00E-01	2.00E-01	1.14E-04	NA	1.14E-04	7.30E-06	NA	9.50E-04	9.50E-04	6.94E-09	NA	6.94E-09
Naphthalene	91-20-3	0.044	4.70E-02	0.89	7.77E-07	NA	2.00E-02	2.00E-02	3.89E-05	NA	3.89E-05	2.49E-07	NA	--	--	NC	NA	NC
Nitrobenzene	98-95-3	0.001	6.96E-03	0.97	1.92E-08	NA	5.00E-04	5.00E-04	3.85E-05	NA	3.85E-05	6.16E-09	NA	--	--	NC	NA	NC
Phenanthrene	85-01-8	0.001	1.40E-01	0.89	1.08E-08	NA	Request	Request	Request	NA	Request	3.46E-09	NA	Request	Request	Request	NA	Request
1,1,1-Trichloroethane	71-55-6	0.038	1.30E-02	0.9	6.83E-07	NA	2.80E-01	2.80E-01	2.44E-06	NA	2.44E-06	2.19E-07	NA	--	--	NC	NA	NC
1,1,2,2-Tetrachloroethane	79-34-5	0.103	6.90E-03	0.7	1.44E-06	NA	6.00E-02	6.00E-02	2.39E-05	NA	2.39E-05	4.60E-07	NA	2.00E-01	2.00E-01	9.19E-08	NA	9.19E-08
1,1,2-Trichloroethane	79-00-5	0.014	6.43E-03	0.81	2.28E-07	NA	4.00E-03	4.00E-03	5.70E-05	NA	5.70E-05	7.30E-08	NA	5.70E-02	5.70E-02	4.16E-09	NA	4.16E-09
1,1-Dichloroethane	75-34-3	0.072	6.70E-03	1	1.44E-06	NA	1.00E-01	1.00E-01	1.44E-05	NA	1.44E-05	4.60E-07	NA	--	--	NC	NA	NC
1,1-Dichloroethene	75-35-4	0.063	1.20E-02	1	1.25E-06	NA	5.00E-02	5.00E-02	2.51E-05	NA	2.51E-05	4.02E-07	NA	--	--	NC	NA	NC
1,2,4-Trichlorobenzene	120-82-1	0.001	6.60E-02	0.97	1.92E-08	NA	1.00E-02	1.00E-02	1.92E-06	NA	1.92E-06	6.16E-09	NA	--	--	NC	NA	NC
1,2-Dichlorobenzene	95-50-1	0.076	4.10E-02	0.8	1.21E-06	NA	9.00E-02	9.00E-02	1.34E-05	NA	1.34E-05	3.86E-07	NA	--	--	NC	NA	NC
1,2-Dichloroethane	107-06-2	0.47	4.20E-03	1	9.33E-06	NA	2.00E-02	2.00E-02	4.66E-04	NA	4.66E-04	2.98E-06	NA	9.10E-02	9.10E-02	2.72E-07	NA	2.72E-07
1,2-Dichloropropane	78-87-5	0.103	7.80E-03	0.74	1.51E-06	NA	--	--	NC	NA	NC	4.84E-07	NA	6.80E-02	6.80E-02	3.29E-08	NA	3.29E-08
1,3-Dichlorobenzene	541-73-1	0.001	5.80E-02	0.8	1.59E-08	NA	3.00E-02	3.00E-02	5.29E-07	NA	5.29E-07	5.08E-09	NA	--	--	NC	NA	NC
1,4-Dichlorobenzene	106-46-7	0.006	4.20E-02	0.9	1.07E-07	NA	3.00E-02	3.00E-02	3.57E-06	NA	3.57E-06	3.43E-08	NA	2.40E-02	2.40E-02	8.23E-10	NA	8.23E-10
2-Butanone	78-93-3	5.1	9.60E-04	0.8	8.10E-05	NA	6.00E-01	6.00E-01	1.35E-04	NA	1.35E-04	2.59E-05	NA	--	--	NC	NA	NC
Acetone	67-64-1	37.5	5.69E-04	0.83	6.18E-04	NA	9.00E-01	9.00E-01	6.86E-04	NA	6.86E-04	1.98E-04	NA	--	--	NC	NA	NC
Benzene	71-43-2	0.793	1.50E-02	0.97	1.53E-05	NA	4.00E-03	4.00E-03	3.81E-03	NA	3.81E-03	4.88E-06	NA	5.50E-02	5.50E-02	2.68E-07	NA	2.68E-07
Carbon disulfide	75-15-0	2.2	1.70E-02	0.63	2.75E-05	NA	1.00E-01	1.00E-01	2.75E-04	NA	2.75E-04	8.80E-06	NA	--	--	NC	NA	NC
Chlorobenzene	108-90-7	0.08	2.80E-02	0.31	4.92E-07	NA	2.00E-02	6.20E-03	2.46E-05	NA	2.46E-05	1.57E-07	NA	--	--	NC	NA	NC
Chloroethane	75-00-3	0.008	6.10E-03	0.8	1.28E-07	NA	4.00E-01	4.00E-01	3.19E-07	NA	3.19E-07	4.09E-08	NA	2.90E-03	2.90E-03	1.19E-10	NA	1.19E-10
Chloroform	67-66-3	0.07	6.80E-03	1	1.39E-06	NA	1.00E-02	1.00E-02	1.39E-04	NA	1.39E-04	4.44E-07	NA	--	--	NC	NA	NC
cis-1,2-Dichloroethene	156-59-2	1.7	1.49E-02	1	3.37E-05	NA	1.00E-02	1.00E-02	3.37E-03	NA	3.37E-03	1.08E-05	NA	--	--	NC	NA	NC
Ethylbenzene	100-41-4	0.44	4.90E-02	0.97	8.47E-06	NA	1.00E-01	1.00E-01	8.47E-05	NA	8.47E-05	2.71E-06	NA	--	--	NC	NA	NC
Methylene chloride	75-09-2	2.4	3.50E-03	0.95	4.52E-05	NA	6.00E-02	6.00E-02	7.54E-04	NA	7.54E-04	1.45E-05	NA	7.50E-03	7.50E-03	1.09E-07	NA	1.09E-07
Tetrachloroethene	127-18-4	0.067	3.30E-02	1	1.33E-06	NA	1.00E-02	1.00E-02	1.33E-04	NA	1.33E-04	4.25E-07	NA	5.40E-01	5.40E-01	2.30E-07	NA	2.30E-07
Toluene	108-88-3	2.9	3.10E-02	0.8	4.60E-05	NA	2.00E-01	2.00E-01	2.30E-04	NA	2.30E-04	1.47E-05	NA	--	--	NC	NA	NC
trans-1,2-Dichloroethene	156-60-5	0.024	7.70E-03	1	4.76E-07	NA	2.00E-02	2.00E-02	2.38E-05	NA	2.38E-05	1.52E-07	NA	--	--	NC	NA	NC
Trichloroethene	79-01-6	5.8	1.20E-02	1	1.15E-04	NA	3.00E-04	3.00E-04	3.84E-01	NA	3.84E-01	3.68E-05	NA	4.00E-01	4.00E-01	1.47E-05	NA	1.47E-05
Vinyl chloride	75-01-4a	0.093	5.60E-03	1	1.85E-06	NA	3.00E-03	3.00E-03	6.15E-04	NA	6.15E-04	5.90E-07	NA	7.20E-01	7.20E-01	4.25E-07	NA	4.25E-07
Xylenes (Total)	1330-20-7	1.4	7.04E-02	0.92	2.56E-05	NA	2.00E-01	2.00E-01	1.28E-04	NA	1.28E-04	8.18E-06	NA	--	--	NC	NA	NC
							Hazard Index:				4.13E-01			Total Cancer Risk:				2.95E-05

Notes:
NA : Not applicable to AOC or exposure

Table B-84a
Calculation of Potential Risks and Hazard Indices
Recreational (Child) (RME)
Ground water AOC-3: Ingestion: Fountain
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	1.5
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	0.1
SA: Skin Surface Area (cm2/event)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	8
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	16.6
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

Compound	CASRN	AOC-3 Ground water (mg/L)	Kp (cm/hr)	OA	Noncancer Hazard Quotient: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD Adjusted (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	Excess Lifetime Cancer Risk: ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF-adjusted [1/(mg/kg-day)]	GW Risk-Ingestion	GW Risk-Dermal	Total GW Risk
Aluminum	7429-90-5	473	2.14E-03	0.1	9.37E-03	NA	1.00E+00	1.00E-01	9.37E-03	NA	9.37E-03	7.49E-04	NA	--	--	NC	NA	NC
Arsenic	7440-38-2	0.006	1.93E-03	0.95	1.14E-06	NA	3.00E-04	3.00E-04	3.79E-03	NA	3.79E-03	9.10E-08	NA	1.50E+00	1.50E+00	1.37E-07	NA	1.37E-07
Beryllium	7440-41-7	0.0216	6.60E-04	0.007	2.99E-08	NA	2.00E-03	1.40E-05	1.50E-05	NA	1.50E-05	2.40E-09	NA	--	--	NC	NA	NC
Chromium	7440-47-3	0.969	1.00E-03	0.013	2.49E-06	NA	1.50E+00	1.95E-02	1.66E-06	NA	1.66E-06	2.00E-07	NA	--	--	NC	NA	NC
Cobalt	7440-48-4	0.104	4.00E-04	0.8	1.65E-05	NA	2.00E-02	2.00E-02	8.24E-04	NA	8.24E-04	1.32E-06	NA	--	--	NC	NA	NC
Lead	7439-92-1	0.147	1.00E-04	0.15	4.37E-06	NA	Request	Request	Request	NA	Request	3.49E-07	NA	Request	Request	Request	NA	Request
Nickel	7440-02-0	0.451	2.00E-04	0.04	3.57E-06	NA	2.00E-02	8.00E-04	1.79E-04	NA	1.79E-04	2.86E-07	NA	--	--	NC	NA	NC
Selenium	7782-49-2	0.032	9.03E-04	0.8	5.13E-06	NA	5.00E-03	5.00E-03	1.03E-03	NA	1.03E-03	4.10E-07	NA	--	--	NC	NA	NC
Thallium	7440-28-0	0.048	1.57E-04	1	9.43E-06	NA	7.00E-05	7.00E-05	1.35E-01	NA	1.35E-01	7.55E-07	NA	--	--	NC	NA	NC
Vanadium	7440-62-2	2.08	1.35E-03	0.026	1.07E-05	NA	1.00E-03	2.60E-05	1.07E-02	NA	1.07E-02	8.57E-07	NA	--	--	NC	NA	NC
Zinc	7440-66-6	38.1	6.00E-04	0.2	1.51E-03	NA	3.00E-01	6.00E-02	5.03E-03	NA	5.03E-03	1.21E-04	NA	--	--	NC	NA	NC
4-Chloroaniline	106-47-8	0.072	6.33E-03	0.5	7.13E-06	NA	4.00E-03	4.00E-03	1.78E-03	NA	1.78E-03	5.70E-07	NA	5.40E-02	5.40E-02	3.08E-08	NA	3.08E-08
4-Methyl-2-pentanone	108-10-1	6.5	3.97E-03	0.8	1.03E-03	NA	8.00E-02	8.00E-02	1.29E-02	NA	1.29E-02	8.24E-05	NA	--	--	NC	NA	NC
bis(2-Chloroethyl)ether	111-44-4	3.8	1.80E-03	0.5	3.76E-04	NA	--	--	NC	NA	NC	3.01E-05	NA	1.10E+00	1.10E+00	3.31E-05	NA	3.31E-05
Isophorone	78-59-1	2.3	3.40E-03	0.5	2.28E-04	NA	2.00E-01	2.00E-01	1.14E-03	NA	1.14E-03	1.82E-05	NA	9.50E-04	9.50E-04	1.73E-08	NA	1.73E-08
Naphthalene	91-20-3	0.044	4.70E-02	0.89	7.76E-06	NA	2.00E-02	2.00E-02	3.88E-04	NA	3.88E-04	6.20E-07	NA	--	--	NC	NA	NC
Nitrobenzene	98-95-3	0.001	6.96E-03	0.97	1.92E-07	NA	5.00E-04	5.00E-04	3.84E-04	NA	3.84E-04	1.54E-08	NA	--	--	NC	NA	NC
Phenanthrene	85-01-8	0.001	1.40E-01	0.89	1.08E-07	NA	Request	Request	Request	NA	Request	8.64E-09	NA	Request	Request	Request	NA	Request
1,1,1-Trichloroethane	71-55-6	0.038	1.30E-02	0.9	6.82E-06	NA	2.80E-01	2.80E-01	2.43E-05	NA	2.43E-05	5.45E-07	NA	--	--	NC	NA	NC
1,1,2,2-Tetrachloroethane	79-34-5	0.103	6.90E-03	0.7	1.43E-05	NA	6.00E-02	6.00E-02	2.39E-04	NA	2.39E-04	1.15E-06	NA	2.00E-01	2.00E-01	2.29E-07	NA	2.29E-07
1,1,2-Trichloroethane	79-00-5	0.014	6.43E-03	0.81	2.28E-06	NA	4.00E-03	4.00E-03	5.69E-04	NA	5.69E-04	1.82E-07	NA	5.70E-02	5.70E-02	1.04E-08	NA	1.04E-08
1,1-Dichloroethane	75-34-3	0.072	6.70E-03	1	1.43E-05	NA	1.00E-01	1.00E-01	1.43E-04	NA	1.43E-04	1.15E-06	NA	--	--	NC	NA	NC
1,1-Dichloroethene	75-35-4	0.063	1.20E-02	1	1.25E-05	NA	5.00E-02	5.00E-02	2.51E-04	NA	2.51E-04	1.00E-06	NA	--	--	NC	NA	NC
1,2,4-Trichlorobenzene	120-82-1	0.001	6.60E-02	0.97	1.92E-07	NA	1.00E-02	1.00E-02	1.92E-05	NA	1.92E-05	1.54E-08	NA	--	--	NC	NA	NC
1,2-Dichlorobenzene	95-50-1	0.076	4.10E-02	0.8	1.20E-05	NA	9.00E-02	9.00E-02	1.34E-04	NA	1.34E-04	9.63E-07	NA	--	--	NC	NA	NC
1,2-Dichloroethane	107-06-2	0.47	4.20E-03	1	9.31E-05	NA	2.00E-02	2.00E-02	4.65E-03	NA	4.65E-03	7.45E-06	NA	9.10E-02	9.10E-02	6.78E-07	NA	6.78E-07
1,2-Dichloropropane	78-87-5	0.103	7.80E-03	0.74	1.51E-05	NA	--	--	NC	NA	NC	1.21E-06	NA	6.80E-02	6.80E-02	8.21E-08	NA	8.21E-08
1,3-Dichlorobenzene	541-73-1	0.001	5.80E-02	0.8	1.58E-07	NA	3.00E-02	3.00E-02	5.28E-06	NA	5.28E-06	1.27E-08	NA	--	--	NC	NA	NC
1,4-Dichlorobenzene	106-46-7	0.006	4.20E-02	0.9	1.07E-06	NA	3.00E-02	3.00E-02	3.56E-05	NA	3.56E-05	8.56E-08	NA	2.40E-02	2.40E-02	2.05E-09	NA	2.05E-09
2-Butanone	78-93-3	5.1	9.60E-04	0.8	8.08E-04	NA	6.00E-01	6.00E-01	1.35E-03	NA	1.35E-03	6.46E-05	NA	--	--	NC	NA	NC
Acetone	67-64-1	37.5	5.69E-04	0.83	6.16E-03	NA	9.00E-01	9.00E-01	6.85E-03	NA	6.85E-03	4.93E-04	NA	--	--	NC	NA	NC
Benzene	71-43-2	0.793	1.50E-02	0.97	1.52E-04	NA	4.00E-03	4.00E-03	3.81E-02	NA	3.81E-02	1.22E-05	NA	5.50E-02	5.50E-02	6.70E-07	NA	6.70E-07
Carbon disulfide	75-15-0	2.2	1.70E-02	0.63	2.75E-04	NA	1.00E-01	1.00E-01	2.75E-03	NA	2.75E-03	2.20E-05	NA	--	--	NC	NA	NC
Chlorobenzene	108-90-7	0.08	2.80E-02	0.31	4.91E-06	NA	2.00E-02	6.20E-03	2.46E-04	NA	2.46E-04	3.93E-07	NA	--	--	NC	NA	NC
Chloroethane	75-00-3	0.008	6.10E-03	0.8	1.28E-06	NA	4.00E-01	4.00E-01	3.19E-06	NA	3.19E-06	1.02E-07	NA	2.90E-03	2.90E-03	2.96E-10	NA	2.96E-10
Chloroform	67-66-3	0.07	6.80E-03	1	1.39E-05	NA	1.00E-02	1.00E-02	1.39E-03	NA	1.39E-03	1.11E-06	NA	--	--	NC	NA	NC
cis-1,2-Dichloroethene	156-59-2	1.7	1.49E-02	1	3.37E-04	NA	1.00E-02	1.00E-02	3.37E-02	NA	3.37E-02	2.69E-05	NA	--	--	NC	NA	NC
Ethylbenzene	100-41-4	0.44	4.90E-02	0.97	8.45E-05	NA	1.00E-01	1.00E-01	8.45E-04	NA	8.45E-04	6.76E-06	NA	--	--	NC	NA	NC
Methylene chloride	75-09-2	2.4	3.50E-03	0.95	4.52E-04	NA	6.00E-02	6.00E-02	7.53E-03	NA	7.53E-03	3.61E-05	NA	7.50E-03	7.50E-03	2.71E-07	NA	2.71E-07
Tetrachloroethene	127-18-4	0.067	3.30E-02	1	1.33E-05	NA	1.00E-02	1.00E-02	1.33E-03	NA	1.33E-03	1.06E-06	NA	5.40E-01	5.40E-01	5.73E-07	NA	5.73E-07
Toluene	108-88-3	2.9	3.10E-02	0.8	4.59E-04	NA	2.00E-01	2.00E-01	2.30E-03	NA	2.30E-03	3.68E-05	NA	--	--	NC	NA	NC
trans-1,2-Dichloroethene	156-60-5	0.024	7.70E-03	1	4.75E-06	NA	2.00E-02	2.00E-02	2.38E-04	NA	2.38E-04	3.80E-07	NA	--	--	NC	NA	NC
Trichloroethene	79-01-6	5.8	1.20E-02	1	1.15E-03	NA	3.00E-04	3.00E-04	3.83E+00	NA	3.83E+00	9.19E-05	NA	4.00E-01	4.00E-01	3.68E-05	NA	3.68E-05
Vinyl chloride	75-01-4c	0.093	5.60E-03	1	1.84E-05	NA	3.00E-03	3.00E-03	6.14E-03	NA	6.14E-03	1.47E-06	NA	1.40E+00	1.40E+00	2.06E-06	NA	2.06E-06
Xylenes (Total)	1330-20-7	1.4	7.04E-02	0.92	2.55E-04	NA	2.00E-01	2.00E-01	1.28E-03	NA	1.28E-03	2.04E-05	NA	--	--	NC	NA	NC
							Hazard Index:				4.12E+00			Total Cancer Risk:				7.46E-05

Notes:
NA : Not applicable to AOC or exposure

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Table B-84b
Calculation of Potential Risks and Hazard indices
Recreational (Child) (CTE)
Ground water AOC-3: Ingestion: Fountain
BROS Human Health Risk Assessment
Bridgeport, NJ

Parameter (units)	Value
ADD: Average Daily Dose (mg/kg-day)	See Below
CW: Chemical Concentration in Water (mg/L)	Chemical-Specific
IR: Ingestion Rate (L/day)	0.87
OA: Oral Absorption Factor (unitless)	Chemical-Specific
FR: Fraction Contaminated (unitless)	0.1
SA: Skin Surface Area (cm2/event)	NA
Kp - Permeability Constant (cm/hr)	Chemical-Specific
ET: Exposure Time (hr/day)	NA
EF: Exposure Frequency (days/year)	4
ED: Exposure Duration (years)	6
BW: Body Weight (kg)	16.6
AT: Averaging Time (days) (75 yr. x 365 days/yr, cancer)	27375
AT: Averaging Time (days) (ED x 365 days/yr, noncancer)	2190
RfD: Reference Dose (mg/kg-day)	Chemical-Specific
CSF: Cancer Slope Factor [1/(mg/kg-day)]	Chemical-Specific

ADD-Ingestion (mg/kg-day) = $\frac{CW \times IR \times FR \times OA \times EF \times ED}{BW \times AT}$

Hazard Quotient (HQ) = ADD (mg/kg-day) / RfD (mg/kg-d)

Cancer Risk (ELCR) = ADD (mg/kg-day) * CSF [1/(mg/kg-day)]

		AOC-3			Noncancer Hazard Quotient							Excess Lifetime Cancer Risk					
Compound	CASRN	Ground water (mg/L)	Kp (cm/hr)	OA	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	Chronic RfD (mg/kg-day)	Chronic RfD- (mg/kg-day)	GW HQ Ingestion	GW HQ Dermal	Total GW HQ	ADD Ingestion (mg/kg-day)	ADD Dermal (mg/kg-day)	CSF [1/(mg/kg-day)]	CSF- adjusted [1/(mg/kg-day)]	GW Risk- Ingestion	GW Risk- Dermal	Total GW Risk
Aluminum	7429-90-5	473	2.14E-03	0.1	2.72E-03	NA	1.00E+00	1.00E-01	2.72E-03	NA	2.72E-03	2.17E-04	NA	--	--	NC	NA	NC
Arsenic	7440-38-2	0.006	1.93E-03	0.95	3.30E-07	NA	3.00E-04	3.00E-04	1.10E-03	NA	1.10E-03	2.64E-08	NA	1.50E+00	1.50E+00	3.96E-08	NA	3.96E-08
Beryllium	7440-41-7	0.0216	6.60E-04	0.007	8.68E-09	NA	2.00E-03	1.40E-05	4.34E-06	NA	4.34E-06	6.95E-10	NA	--	--	NC	NA	NC
Chromium	7440-47-3	0.969	1.00E-03	0.013	7.24E-07	NA	1.50E+00	1.95E-02	4.82E-07	NA	4.82E-07	5.79E-08	NA	--	--	NC	NA	NC
Cobalt	7440-48-4	0.104	4.00E-04	0.8	4.78E-06	NA	2.00E-02	2.00E-02	2.39E-04	NA	2.39E-04	3.82E-07	NA	--	--	NC	NA	NC
Lead	7439-92-1	0.147	1.00E-04	0.15	1.27E-06	NA	Request	Request	Request	NA	Request	1.01E-07	NA	Request	Request	Request	NA	Request
Nickel	7440-02-0	0.451	2.00E-04	0.04	1.04E-06	NA	2.00E-02	8.00E-04	5.18E-05	NA	5.18E-05	8.29E-08	NA	--	--	NC	NA	NC
Selenium	7782-49-2	0.032	9.03E-04	0.8	1.49E-06	NA	5.00E-03	5.00E-03	2.98E-04	NA	2.98E-04	1.19E-07	NA	--	--	NC	NA	NC
Thallium	7440-28-0	0.048	1.57E-04	1	2.74E-06	NA	7.00E-05	7.00E-05	3.91E-02	NA	3.91E-02	2.19E-07	NA	--	--	NC	NA	NC
Vanadium	7440-62-2	2.08	1.35E-03	0.026	3.11E-06	NA	1.00E-03	2.60E-05	3.11E-03	NA	3.11E-03	2.48E-07	NA	--	--	NC	NA	NC
Zinc	7440-66-6	38.1	6.00E-04	0.2	4.38E-04	NA	3.00E-01	6.00E-02	1.46E-03	NA	1.46E-03	3.50E-05	NA	--	--	NC	NA	NC
4-Chloroaniline	106-47-8	0.072	6.33E-03	0.5	2.07E-06	NA	4.00E-03	4.00E-03	5.17E-04	NA	5.17E-04	1.65E-07	NA	5.40E-02	5.40E-02	8.93E-09	NA	8.93E-09
4-Methyl-2-pentanone	108-10-1	6.5	3.97E-03	0.8	2.99E-04	NA	8.00E-02	8.00E-02	3.73E-03	NA	3.73E-03	2.39E-05	NA	--	--	NC	NA	NC
bis(2-Chloroethyl)ether	111-44-4	3.8	1.80E-03	0.5	1.09E-04	NA	--	--	NC	NA	NC	8.73E-06	NA	1.10E+00	1.10E+00	9.60E-06	NA	9.60E-06
Isophorone	78-59-1	2.3	3.40E-03	0.5	6.61E-05	NA	2.00E-01	2.00E-01	3.30E-04	NA	3.30E-04	5.28E-06	NA	9.50E-04	9.50E-04	5.02E-09	NA	5.02E-09
Naphthalene	91-20-3	0.044	4.70E-02	0.89	2.25E-06	NA	2.00E-02	2.00E-02	1.12E-04	NA	1.12E-04	1.80E-07	NA	--	--	NC	NA	NC
Nitrobenzene	98-95-3	0.001	6.96E-03	0.97	5.57E-08	NA	5.00E-04	5.00E-04	1.11E-04	NA	1.11E-04	4.46E-09	NA	--	--	NC	NA	NC
Phenanthrene	85-01-8	0.001	1.40E-01	0.89	3.13E-08	NA	Request	Request	Request	NA	Request	2.51E-09	NA	Request	Request	Request	NA	Request
1,1,1-Trichloroethane	71-55-6	0.038	1.30E-02	0.9	1.98E-06	NA	2.80E-01	2.80E-01	7.06E-06	NA	7.06E-06	1.58E-07	NA	--	--	NC	NA	NC
1,1,2,2-Tetrachloroethane	79-34-5	0.103	6.90E-03	0.7	4.16E-06	NA	6.00E-02	6.00E-02	6.93E-05	NA	6.93E-05	3.33E-07	NA	2.00E-01	2.00E-01	6.65E-08	NA	6.65E-08
1,1,2-Trichloroethane	79-00-5	0.014	6.43E-03	0.81	6.61E-07	NA	4.00E-03	4.00E-03	1.65E-04	NA	1.65E-04	5.28E-08	NA	5.70E-02	5.70E-02	3.01E-09	NA	3.01E-09
1,1-Dichloroethane	75-34-3	0.072	6.70E-03	1	4.16E-06	NA	1.00E-01	1.00E-01	4.16E-05	NA	4.16E-05	3.33E-07	NA	--	--	NC	NA	NC
1,1-Dichloroethene	75-35-4	0.063	1.20E-02	1	3.63E-06	NA	5.00E-02	5.00E-02	7.26E-05	NA	7.26E-05	2.91E-07	NA	--	--	NC	NA	NC
1,2,4-Trichlorobenzene	120-82-1	0.001	6.60E-02	0.97	5.57E-08	NA	1.00E-02	1.00E-02	5.57E-06	NA	5.57E-06	4.46E-09	NA	--	--	NC	NA	NC
1,2-Dichlorobenzene	95-50-1	0.076	4.10E-02	0.8	3.49E-06	NA	9.00E-02	9.00E-02	3.88E-05	NA	3.88E-05	2.79E-07	NA	--	--	NC	NA	NC
1,2-Dichloroethane	107-06-2	0.47	4.20E-03	1	2.70E-05	NA	2.00E-02	2.00E-02	1.35E-03	NA	1.35E-03	2.16E-06	NA	9.10E-02	9.10E-02	1.97E-07	NA	1.97E-07
1,2-Dichloropropane	78-87-5	0.103	7.80E-03	0.74	4.38E-06	NA	--	--	NC	NA	NC	3.50E-07	NA	6.80E-02	6.80E-02	2.38E-08	NA	2.38E-08
1,3-Dichlorobenzene	541-73-1	0.001	5.80E-02	0.8	4.59E-08	NA	3.00E-02	3.00E-02	1.53E-06	NA	1.53E-06	3.68E-09	NA	--	--	NC	NA	NC
1,4-Dichlorobenzene	106-46-7	0.006	4.20E-02	0.9	3.10E-07	NA	3.00E-02	3.00E-02	1.03E-05	NA	1.03E-05	2.48E-08	NA	2.40E-02	2.40E-02	5.95E-10	NA	5.95E-10
2-Butanone	78-93-3	5.1	9.60E-04	0.8	2.34E-04	NA	6.00E-01	6.00E-01	3.91E-04	NA	3.91E-04	1.87E-05	NA	--	--	NC	NA	NC
Acetone	67-64-1	37.5	5.69E-04	0.83	1.79E-03	NA	9.00E-01	9.00E-01	1.99E-03	NA	1.99E-03	1.43E-04	NA	--	--	NC	NA	NC
Benzene	71-43-2	0.793	1.50E-02	0.97	4.42E-05	NA	4.00E-03	4.00E-03	1.10E-02	NA	1.10E-02	3.53E-06	NA	5.50E-02	5.50E-02	1.94E-07	NA	1.94E-07
Carbon disulfide	75-15-0	2.2	1.70E-02	0.63	7.96E-05	NA	1.00E-01	1.00E-01	7.96E-04	NA	7.96E-04	6.37E-06	NA	--	--	NC	NA	NC
Chlorobenzene	108-90-7	0.08	2.80E-02	0.31	1.42E-06	NA	2.00E-02	6.20E-03	7.12E-05	NA	7.12E-05	1.14E-07	NA	--	--	NC	NA	NC
Chloroethane	75-00-3	0.008	6.10E-03	0.8	3.70E-07	NA	4.00E-01	4.00E-01	9.24E-07	NA	9.24E-07	2.96E-08	NA	2.90E-03	2.90E-03	8.58E-11	NA	8.58E-11
Chloroform	67-66-3	0.07	6.80E-03	1	4.02E-06	NA	1.00E-02	1.00E-02	4.02E-04	NA	4.02E-04	3.22E-07	NA	--	--	NC	NA	NC
cis-1,2-Dichloroethene	156-59-2	1.7	1.49E-02	1	9.76E-05	NA	1.00E-02	1.00E-02	9.76E-03	NA	9.76E-03	7.81E-06	NA	--	--	NC	NA	NC
Ethylbenzene	100-41-4	0.44	4.90E-02	0.97	2.45E-05	NA	1.00E-01	1.00E-01	2.45E-04	NA	2.45E-04	1.96E-06	NA	--	--	NC	NA	NC
Methylene chloride	75-09-2	2.4	3.50E-03	0.95	1.31E-04	NA	6.00E-02	6.00E-02	2.18E-03	NA	2.18E-03	1.05E-05	NA	7.50E-03	7.50E-03	7.86E-08	NA	7.86E-08
Tetrachloroethene	127-18-4	0.067	3.30E-02	1	3.85E-06	NA	1.00E-02	1.00E-02	3.85E-04	NA	3.85E-04	3.08E-07	NA	5.40E-01	5.40E-01	1.66E-07	NA	1.66E-07
Toluene	108-88-3	2.9	3.10E-02	0.8	1.33E-04	NA	2.00E-01	2.00E-01	6.66E-04	NA	6.66E-04	1.07E-05	NA	--	--	NC	NA	NC
trans-1,2-Dichloroethene	156-60-5	0.024	7.70E-03	1	1.38E-06	NA	2.00E-02	2.00E-02	6.89E-05	NA	6.89E-05	1.10E-07	NA	--	--	NC	NA	NC
Trichloroethene	79-01-6	5.8	1.20E-02	1	3.33E-04	NA	3.00E-04	3.00E-04	1.11E+00	NA	1.11E+00	2.66E-05	NA	4.00E-01	4.00E-01	1.07E-05	NA	1.07E-05
Vinyl chloride	75-01-4c	0.093	5.60E-03	1	5.34E-06	NA	3.00E-03	3.00E-03	1.78E-03	NA	1.78E-03	4.27E-07	NA	1.40E+00	1.40E+00	5.98E-07	NA	5.98E-07
Xylenes (Total)	1330-20-7	1.4	7.04E-02	0.92	7.40E-05	NA	2.00E-01	2.00E-01	3.70E-04	NA	3.70E-04	5.92E-06	NA	--	--	NC	NA	NC
							Hazard Index:				1.20E+00			Total Cancer Risk:				2.16E-05

Notes:
NA : Not applicable to AOC or exposure